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The Arthur E. Mills Memorial Oration

THE PHYSICIAN IN TRAINING.

By PROFESSOR M. L. ROSENHEIM,[2]
University of London.

I WELCOME this opportunity of expressing, in public, my very deep gratitude to The Royal Australasian College of Physicians, to its President and Council, for the invitation to come here as the Sir Arthur Sims Commonwealth Travelling Professor, and also of thanking my numerous friends, old and new, throughout Australia and New Zealand, for their wonderful hospitality and companionship. I have spent a most enjoyable, remarkable and memorable three months. I can, of course, never adequately express my thanks to Sir Arthur Sims himself, whose outstanding generosity has made my trip, and those of my predecessors and successors, possible.

We are met here today to commemorate the name of Arthur Edward Mills, the first Professor of the Principles and Practice of Medicine in the University of Sydney, and sometime its Deputy Chancellor. Qualifying in the second batch of graduates in medicine from the University in 1889, Arthur Mills had a fascinating and distinguished career, a career which appears to divide itself into three main periods. First came post-graduate training, posts at the Royal Prince Alfred Hospital, a demonstratorship in anatomy and, as his obituary notice expresses it, the opportunity to gain inspiration from three great medical scientists. These were J. T. Wilson, Professor of Anatomy, and later my Professor of Anatomy at Cambridge, Sir Charles Martin, demonstrator in physiology, and later the Director of the Lister Institute of Medical Research in London, and J. P. Hill, then a demonstrator in biology and later to become Professor of Embryology at University College, London. These men were part of the flow of distinguished scientists from Australia to the United Kingdom that has continued unabated since then.

Arthur Mills is described as "a zealous apostle of the scientific aspect of medicine", but, and how well we can understand this even at the present day, he was forced to give up a career of research in physiological and experimental science for financial reasons, since, as his biographer tells us, no remunerative academic post was then vacant.

So started the second period, for he went into general practice. This period continued for more than fifteen years, though in 1898 he was appointed an honorary assistant physician to the Royal Prince Alfred Hospital. Let me quote again from his obituary:

[1] Delivered in the Great Hall of the University of Sydney at the annual ceremony of The Royal Australasian College of Physicians on June 4, 1958.

[2] Sims Commonwealth Travelling Professor for 1958.

> It was this experience that ripened his knowledge of medicine and of mankind; of medicine, because he was never content to let his scientific knowledge stagnate, but by omnivorous reading and persistent observation and inquiry probed as far as he could the mysteries of clinical medicine; of mankind, because his visits to his patients' homes led him to realise that knowledge of human nature was a most important equipment of any physician.

The third period started in 1910, when he returned to the University of Sydney as Lecturer in the Principles and Practice of Medicine. His lectures struck a new note, for he lectured on applied physiology and was "the high priest of the new medicine which was being built on physiological conceptions applied to disease". Appointed professor in 1920, he remained keenly interested in such aspects of medicine—in dyspnœa, cyanosis and œdema, and in the reaction of the blood and tissue fluids. He must have been a wonderfully stimulating teacher, getting the best out of his students by means of probing questions, his bedside teaching always tempered by his human interest. I am sorry that I was never able to sit at his feet.

I am, I believe, the first professor of medicine, certainly the first whole-time professor, to deliver the Arthur Mills Oration, and, since one of the purposes of its founders was to promote medical education, I intend to consider the post-graduate training of a physician today, remembering the three phases of Arthur Mills's own development. At first I wondered whether this was a suitable subject to discuss before this distinguished, but largely non-medical, audience, but I reassured myself because, in my experience, university authorities are keenly interested in all aspects of medical training (which absorbs so large a part of their budget), while the problems of post-graduate training in medicine must have much in common with those that concern other professions in which maturity is reached only many years after graduation.

One of the fascinations of medicine lies in the fact that, once qualified, one has virtually a second choice of career. Out of each year's graduates, many will become general practitioners, some will become consultant physicians or surgeons or enter some specialty, perhaps one or two will retire to the quietness of the bacteriological or pathological laboratory or return to the preclinical sciences. Others may prefer a more adventurous life in the services, in tropical medicine or missionary endeavour, or even in Antarctic exploration.

A similar, but more restricted, choice must, I fancy, await the graduate in other professions—in science, engineering or law—but here the choice may already have been made while an undergraduate, and special courses taken while still a student.

We do not encourage medical students to specialize before qualification, but I firmly believe that, at some period in undergraduate training, each student should study some subject more deeply than the rest, should realize the limitations of our present knowledge, and should see how research is pushing back the frontiers. The Bachelor of Science degree in Medical Science in this university supplies just that need, and we in London encourage our better students to spend an extra year in one of the preclinical sciences. The American system of elective studies allows every student the opportunity of pursuing special interests.

The aims of undergraduate medical education have been widely, perhaps too widely, discussed in recent years. I shall content myself by stressing that we cannot teach the student of medicine all the known facts. We aim first to teach the essential basic knowledge of disease processes, their pathogenesis, diagnosis and treatment, and secondly, to instil a scientific and critical outlook, which will enable the student to accept and incorporate the advances that are to come. According to Sir George Pickering, the Dean of Harvard Medical School once told his students that in ten years' time half of what they had been taught would have been shown to be wrong, and that the trouble was that neither he nor any of their teachers knew which half. This need for critical assessment of advances in medical knowledge, and for the application of such advances to man, distinguishes medical education from pure technology.

The recent introduction of the compulsory intern year has helped to round off undergraduate medical experience. It provides practice and responsibility under supervision, and should relieve the undergraduate years of some of the mass of detail. In England many of us wonder whether we are making the best use of this year, and whether we have not, so far, missed the opportunity of improving undergraduate education.

The modern physician requires three major attributes; first of all, clinical experience, then experience of human nature and an interest in his fellow men, and finally a critical and scientific outlook. As a professor of medicine you may expect me to stress the last attribute, the scientific outlook often based on research experience, but I believe that all three attributes are essential, and the difficulty today is to combine these three in a single person. Let us consider them separately.

There is no real short-cut to clinical experience and, in the past, the training of the physician depended almost entirely upon an intense and thorough grounding in clinical medicine. In this country, as in the United Kingdom, this has always depended upon bedside teaching; upon the house physician, the assistant registrar and the registrar attached to a chief, seeing patients, treating patients, investigating patients and discussing patients. I do not believe that there is any satisfactory alternative to gaining clinical experience by the process of increasing responsibility while practising under the direction of an experienced physician.

Both in Australia and in New Zealand the newly qualified doctor appears usually to work for only three months under any one chief, while in England a house physician or house surgeon spends six months in his post. I am assured that the shorter periods produce mature doctors with wide and varied clinical experience. However, it is only when I have had a house physician for six months that I feel (provided that I have not spent three of those months travelling in Australia and New Zealand) that I have been able to impart to him some of my philosophy of medicine, how I deal with patients, why I feel that some patients need more intense investigation than others, how best to use the laboratory in diagnosis, how to accept modern advances and how critically to assess the effects of drugs. I can never, myself, be sufficiently grateful for the clinical experience I gained as a student, house physician and registrar by association with clinicians of deep experience.

In the United States the system of rotation of appointments has been widely expanded. The intern, even if he spends a full year in the department of medicine, still moves from ward to ward, specialty to specialty and serves under a varied collection of chiefs and residents. He appears constantly to be taking over partly investigated patients and passing on his own incomplete cases to others. Their system goes further, for the members of the senior staff, engaged either in research or in private practice (or both), themselves spend only a few months each year in charge of a ward, acting in a consultative capacity. The care of the patients thus really devolves upon the registrar or resident. This system is popular with the consultants, for they have more time to devote to their special interests, and with the residents, who thus have enhanced responsibility. The continued association of the young graduate with the experienced clinician is, however, missing.

In his recent book, Snapper (1956), that grand old clinician whose lucid accounts of sarcoidosis and of regional ileitis were so thrilling and stimulating and whose books on bone disease are classics, points out the strength that American medicine drew from the old Dutch tradition of bedside teaching, and urges a return to Hippocratic methods, to true clinical teaching rather than to side-room discussion. This is a plea that many of us who have visited the United States would echo.

Even if there is no short cut, clinical experience can be greatly widened by the best use being made of the clinical material in any hospital. There are enormous advantages to be gained from the organization of grand rounds, specialty rounds and clinico-pathological conferences, where patients are discussed, knowledge can be pooled and the older physicians can share with the juniors their clinical experience, while learning of the recent advances in scientific medicine. Such exercises are of extreme importance to the physician-in-training, especially if he has to present the patient and has to read up and discuss the problems of diagnosis and treatment. It is always exciting to me to see the difference between the first case presented by a young registrar and one presented three years later (for our registrars normally serve for three years). "Exchange of information", says Bean (1954), "is the key to good morale." Such conferences enormously increase the morale of a hospital and keep the staff, both senior and junior, on their toes. If space, as it should, allows the attendance of undergraduate students, they savour the excitement of clinical discussion and learn some of the problems of diagnosis and the ever-present possibility of error. I have been much impressed, in both Australia and New Zealand, by the staff conferences that I have been privileged to attend, and believe that these are of the greatest value to both undergraduate and post-graduate education.

It is only when one has to organize a weekly staff round that one realizes the wealth of clinical material that passes through any hospital and the value of sharing experience. Such rounds are, and I have no doubt of this, to the great advantage of the patient. Here is the real consultation, where experts in various fields can pool their knowledge, making diagnosis and treatment more efficient. Any patient with a difficult diagnostic problem fares better in the rough and tumble of a general ward than in the ivory fastness of a private room.

The second essential attribute of the physician is that of an intense interest in humanity, in the individual patient and in his immediate problems. He must have an understanding and appreciation of the effect of mind on the body, of the way in which hidden fears and anxieties may produce symptoms, and of the important part that the physician can play in helping the individual by patient listening, by reasoned explanation and by firm reassurance. The impact of environment must be considered in every case, and he must realize that he may do more real good by solving some social problem for one patient than by diagnosing some obscure syndrome in another.

These social aspects of medicine have been much stressed in recent years, mainly as a reaction from increasing specialization. The older clinicians did not require a separate discipline of social medicine, nor do the general physicians today. If the physician-in-training does not enjoy this human side of medicine, he should retire to the laboratory and should not try to face the problems of the busy ward.

I do not wish to be misunderstood. What I have just said does not mean that I do not value the help of the trained psychiatrist in the diagnosis and treatment of my patients, or that I do not appreciate the important role of the social epidemiologist in elucidating social causes of disease. Both these specialists are important members of the modern medical team, both should assist in the education of the student and new graduate and should take part in clinical conferences, but neither should be allowed to annex that personal interest that the physician must take in the welfare of his own patients.

I believe that this interest in the human side of medicine, in the psychological problems of patients and in the interplay of personalities must take root, if ever it will, at the very outset of the student's clinical career, and that its growth is again best encouraged by example and by bedside instruction.

We all agree that such wide clinical and human experience is essential. Why does the physician also require research experience? There are many answers to this.

The physician of today must possess that critical attitude to disease and to therapeutics that leads him constantly to question whether what is written and said is true, and whether his doubts could not be resolved by experiment. Everything that we can measure, that we can express mathematically, is another victory over empiricism. Measurement is becoming increasingly possible, though often highly involved, but often the end result of successful clinical research permits redefinition of the problem in purely clinical terms and the recognition of new features of a disease that can be diagnosed by the bedside. The great advances in cardiology that have followed cardiac catheterization and the measurement both of pressures and of the oxygen saturation of the blood in the chambers of the heart and in the lungs, have redrawn the clinical picture of many forms of heart disease. The correlation of biochemical findings with clinical observations has similarly defined many metabolic and endocrine disorders.

Modern medicine has become increasingly specialized, and those interested in the disorders of special systems have devised and perfected methods of accurate investigation and diagnosis. I have referred to the cardiologist; my remarks could equally have applied to the chest physician, to the gastro-enterologist, to the hæmatologist, to the physician interested in renal disease and to the neurologist. The trainee in any of these special branches must learn the methods by which our knowledge is being broadened, must study the intricate procedures of investigation, and must appreciate how much reliance can be placed upon the results obtained. No chemist will depute to his technician a method with which he is not himself fully familiar, and, so far as is possible, the specialist should not be dependent upon technical investigations which he does not fully understand and the reliability of which he does not know from personal experience. Such knowledge is best gained, by the post-graduate, in the research laboratory of the special department, working either alone or in a team.

Many young physicians, given the opportunity of working in a research laboratory or of learning the techniques of other sciences, will carry back to clinical work an eager desire to continue to attempt to advance our knowledge. However, it is not given to everyone to be a successful research worker, any more than can every research genius also be a successful clinician. There has in the past, unfortunately, been a wide gap between the practising physician and the research worker, a gap that arises largely from lack of understanding, and both undergraduate and post-graduate education today should continually aim at narrowing this gap.

How are we to train this physician of the future? How can we produce this ideal, the scientific physician, armed with clinical experience, humanity and a critical experimental outlook? First I would stress that there should be no stereotyped, accepted pathway along which the embryo consultant is expected to pass. There is some danger, in the United Kingdom, where committees meet and discuss the training of the cardiologist, neurologist, or pædiatrician, that their recommendations may be regarded as rules, and that appointment boards may become more interested in the planned career than in the actual clinical and research experience of the candidate. The former routine pathway is now too short, and there must be scope for diversion, and for periods spent in the laboratory, on research or in travelling.

There is, of course, a marked difference between the registrar appointment here and in England. Here the post is normally held for one year after the usual house appointments and precedes an attempt at the membership examination. Our registrars, especially those in the teaching hospitals, are more senior, are usually already members of the College, and can hold the post for three years.

It is not easy to select those who are likely to make good physicians. Our registrars are appointed for one year in the first instance and, if they do not appear to make the grade, they have lost nothing by a further year's

experience in medicine and are better equipped for general practice. They take an active part in the teaching of undergraduates, and we regard these teaching duties as of great benefit to the physician-in-training.

After the registrar appointment, pathways must diverge. Some may be selected for a senior registrar appointment, some may pass on to academic posts on professorial clinical units, while others will leave their own schools and go elsewhere, at home or abroad, in order to widen their experience.

Both the senior registrar and the assistant on the academic unit should be given increasing clinical responsibility; each should have research opportunity. I believe that every registrar should have some research problem on which he works, alone or in a team. This need not necessarily involve complicated laboratory procedures. It may be the controlled trial of a new drug, the observation of the natural history of a disease, or the elucidation of the value and significance of some physical sign. The physician-in-training, while doing his clinical appointments, must have time not only to read and think, but also to engage in some research. If he is swamped by routine clinical duties, he cannot extract full educational advantages from his position. Hospital boards must appreciate that their junior staff are still under training and that they do require time free from routine work.

It is equally important that academic posts should be closely linked with clinical work. As the young assistant becomes increasingly interested and knowledgeable in some special condition, he should be encouraged by being given clinical facilities, with charge of a few beds in which he can investigate and treat his own patients. As he probes deeper into certain problems, he will probably find that he needs the help of allied disciplines. He may then wish to spend time in one of the preclinical departments, he may need to carry his problem to animal experiment, or he may wish to go to some special centre, where he can work under an expert who is devoting himself to similar problems.

In Great Britain, the Medical Research Council, with real foresight, has founded a series of Fellowships in Clinical Research, and the trainee is seconded from his own hospital and given the opportunity of going to learn some special technique. These fellowships are well paid, and almost the only stipulation that the Medical Research Council makes is that the trainee must be taken back by his own hospital or school at the end of the year. These fellowships are of very great value. They help to broaden the experience and widen the knowledge of the young worker, while giving him the opportunity of standing away from clinical medicine for a period and gaining insight into more pure research.

There is a West African proverb that states that "A child who has never been to another man's farm will boast that there is no farm larger than his father's".

Since the war, travel has become increasingly possible and increasingly popular. Each of the full assistants on my unit at University College Hospital, London, has spent at least one year overseas, working in the department of medicine in one of the great American centres, while an increasing number of our medical registrars are being seconded, by our Board of Governors, for a year abroad, returning to finish their appointment.

It has, of course, long been the custom for the young Australian or New Zealand physician to make the Grand Tour, to spend a year or more overseas, visiting either the United Kingdom or America. This was, in the past, alleged to be necessary because of isolation, but what I have seen during my brief visit to the various centres here and in New Zealand has confirmed what we have long appreciated in England, that the clinical training acquired here is of the very highest. We have long been impressed by the clinical standard and maturity of our visitors from Australia and New Zealand.

Unfortunately, many visitors to Great Britain spend much of their time attending special courses in the various Institutes of the British Postgraduate Federation, or, by travelling from centre to centre, gain a rather superficial view of British medicine. I feel strongly, and I know that my feelings are shared both here and in the United Kingdom, that the Commonwealth visitor, who is aspiring to consultant status, should not so spend his time, should not worry unduly about gaining further higher qualifications, but should have a real chance of seeing what goes on in the places he visits. Ideally, he should try to obtain a post as house physician or registrar in a good hospital, or go as a research assistant to some unit.

All academic units in England and Scotland welcome young visitors as research workers, are delighted to have them about the place, learning techniques, seeing how things are done and joining in the work, both clinical and research. Unfortunately, few units can afford to support such visitors out of their annual budgets, and research assistants are dependent upon outside grants, either from here or from there. Such grants are increasing in number, but it is essential that they should be sufficient for the recipient to live without undue financial strain.

On the other hand, it is becoming increasingly easy to obtain registrar appointments in the United Kingdom, in teaching as well as in non-teaching hospitals, posts with clinical responsibility, established and paid under the National Health Service. During the past years we have not only had Australian assistants on our medical, surgical and obstetric units, but have also had Australian, Canadian and Indian registrars working in the hospital. Not only do the visitors gain far more from such an intimate relationship with a hospital, but the hospital and its staff also gain by contact with workers from overseas.

The increasing complexity of medicine is leading to an ever-increasing length of time needed to train the physician. This prolonged period of development to full maturity must be associated with a sense of security—and with the expectation of an established post at the end of training. Alan Gregg, of the Rockefeller Foundation, has stressed that men of superior character and capacity should have freedom, responsibility and expectation.

If the medical profession, the universities and the hospitals accept the need for the thorough and prolonged training of the future specialist, financial security must be provided—financial support for the young research worker, adequate support for travel abroad, and suitably paid academic and other posts to which the traveller can return, so that he may share with his colleagues the knowledge that he has gained abroad.

The physician today, when his training has been completed, should, if he so desire, be able to combine clinical practice with his special research interest. There is, in both the United Kingdom and here, a very great shortage of suitably paid senior posts, in which such a physician can continue his research, while having clinical responsibility and care of patients. Few people can, or do, continue effective research throughout their lives, but, while young, keen and freshly trained in modern techniques, the physician should be encouraged to devote energy, thought and time to the advancement of his subject by experiment. The present organization of hospital staffing, not only in the teaching hospitals, requires review and overhaul in order to provide such posts, the holders of which will, of course, require both laboratory space and technical aid. How Arthur Mills would have welcomed such a post! A nucleus of such physicians working at any hospital makes an enormous difference to the whole outlook of the institution, and provides an enormous stimulus to both undergraduate and post-graduate students.

These, then, are my scattered thoughts on the problems of training the physician, problems which require serious consideration both in the United Kingdom and elsewhere in the Commonwealth.

Our two great Colleges, in London and in Australia and New Zealand, have always striven to improve the level of medical practice. The membership examination in both countries sets a very high standard and places a premium on clinical experience. Both have their fellowships and

scholarships for the promotion of research and both are increasingly interested in the post-graduate education of the physician.

The Colleges and the Universities must, I believe, keep pace with the changing face of medicine and must strive to see that hospital boards provide their fully trained physicians with the opportunity not only to treat the sick, but also to fulfil themselves in the continued advancement of medical knowledge.

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RADIATION HAZARDS IN INDUSTRY.[1]

By GORDON C. SMITH,

School of Public Health and Tropical Medicine, University of Sydney.

THE increasing use of irradiating apparatus and radioactive substances in medical and related spheres, in biological, agricultural and other forms of scientific research and in industry and commerce, represents an important development of the post-war era. As a result there is little doubt that more and more people will become occupationally concerned with sources of ionizing radiations, with consequent risk to health from excessive exposure. Particular care must be taken to ensure that isotopes and irradiating apparatus are not used by inexperienced or untrained persons, or by those who are ignorant of the dangers and unaware of the necessary precautions. However, it has been shown that the risks are controllable and within limits can be accepted. We have to remember that atomic energy is not really something new, for man has always been exposed to radiation of low intensity from cosmic rays and naturally occurring radioactive elements.

According to the United Nations Scientific Committee on the Effects of Atomic Radiation (1957), artificial irradiation is derived from (i) the contamination of the environment, the atmosphere, or water by radioactive waste from atomic industries or from users of radioelements; (ii) the radioactive fallout, at greater or lesser distances from the source, or radioactivity resulting from the explosion of nuclear devices; (iii) the occupational exposure of certain groups of workers—medical practitioners, radiologists, dentists, nurses, atomic energy workers, uranium or thorium miners and the industrial or scientific users of radiation generators or radioactive isotopes; (iv) the medical use of X rays, other ionizing radiations and radioelements in the detection, diagnosis, investigation and treatment of human diseases; (v) the use of certain devices which emit radiation such as television receivers, watches with luminous dials and the X-ray generators used for the purpose of fitting shoes.

The main purpose of this paper is to present briefly some aspects of industrial radiation hazards, but I propose to use the word industry in a broad concept and to refer also to some of the occupational exposures mentioned in (iii) above.

[1] Read at a meeting of the Section of Public Health, Industrial Medicine and Hospital Administration, with the Section of Radiology and Radiotherapy, Australasian Medical Congress (B.M.A.), Tenth Session, Hobart, March 1 to 8, 1958.

A brief survey of the uses of irradiating apparatus and radiactive substances will show the wide range of applications that is involved and will indicate possible sources of risk to health.

Uses of Irradiating Apparatus.

In industry, X-ray equipment is used for the radiographic examinations of castings, forgings, welds and other metal structures for defects, or for the fluoroscopic examination of manufactured articles for various purposes, e.g. to check for the correct assembly of components or to detect foreign material.

The professional use of X-ray apparatus for diagnostic and therapeutic purposes by the medical profession, dentists, and veterinary surgeons represents an important source of radiation.

In research undertakings various types of irradiating devices are employed, and in the commercial field fluoroscopes are used for shoe fitting and X rays for epilation.

Uses of Radioactive Substances.

We are all familiar with the medical uses of radium, and these need not be further mentioned. In industry radium is used in self-luminous paints, for gamma radiography, and for the elimination of static electricity.

The wide range of artificial radioactive substances or radioisotopes, which is being produced as a result of atomic energy developments, is being employed increasingly in medical, industrial and research activities. In medicine several radioactive isotopes are being used for investigational purposes, for diagnosis or for therapy. In industry important uses for radioisotopes are as sources for gamma radiography, for which purpose they have several advantages over X-ray equipment, and as thickness gauges to measure and control the thickness of materials during rolling. Isotopes are also being used for many other purposes; for example, package sorting, liquid level gauges, following the flow of oils in pipelines, the detection of leakage in water lines, oil lines or gas mains, cold sterilization of food and drugs, static elimination, and as tracers in many chemical, physical, engineering, metallurgical, agricultural and biological processes.

Other Sources of Exposure to Ionizing Radiations.

Two sources which are of importance from the industrial and occupational aspects are nuclear reactors and uranium mining, milling and treatment.

It is not proposed to consider any further the health and safety aspects of reactors. They constitute a special problem to which proper justice could not be done in the short time that is available for this presentation.

Health Hazards.

In the industrial and occupational exposures to ionizng radiations with which we are concerned here, the types of radiation most likely to be encountered are alpha particles, beta rays, gamma rays and X rays.

Injury to the human may occur as the result of: (i) Exposure of the body as a whole, or of limited areas, such as the hands, to beta or gamma radiation from radioactive substances external to the body. External hazards also arise from exposure to X rays and neutrons. (ii) Deposition of radioactive material in the body, from ingestion, inhalation or absorption through the intact or injured skin surface, of material emitting alpha, beta or gamma radiation. Irradiation of selected organs after the uptake of a radioactive substance into the body may occur.

McLean (1955) states that when we consider radioactivity as an occupational health problem we are seldom, if ever, concerned with the consequences of massive doses of radiation, and although much is known about these acute effects this knowledge is of little assistance when we attempt to assess the hazards of radiation work. Whilst it is true that in occupational exposures the delayed insidious effects of small repeated doses of radiation over a prolonged period represent the major health problem.

incidents may occur as a result of carelessness or ignorance, in which an individual would receive a large dose in a short time.

The occupational experiences of three groups of workers have contributed useful knowledge about the hazards of ionizing radiations. The data concerning the injuries received by these workers have been reviewed recently by Loutit (1954), by McLean (1955) and by the Committee appointed by the Medical Research Council (1956) to report on the hazards to man of nuclear and allied radiations, and the following points are of interest. (*a*) Many miners who worked in radioactive pitchblende (uranium oxide) ores in the Schneeberg mines of Saxony and in Joachimsthal developed cancer of the lung, and this is now believed to have been due to inhalation of the radioactive gas, radon, although arsenic has also been blamed. (*b*) Luminous-dial painters (mostly girls) ingested minute amounts of radium, mesothorium and radiothorium in painting instrument dials with self-luminous paints during and after the first world war. The radioactive elements were retained in the skeleton and damaged particularly the blood-forming tissues and bones with the result that aplastic or refractory anæmia, osteitis and osteosarcomata occurred. (*c*) Many of the pioneer radiologists and radiographers suffered damage to the skin, including malignant lesions, or to the blood-forming tissues, resulting in aplastic anæmia or leukæmia. They were exposed mainly to external irradiation by X rays and gamma rays.

These tragic events belong to the past and they ought never to be repeated in the future. However, from the study of these hazards we have learned much about the injurious effects of ionizing radiations, and have obtained data for the establishment of standards of safe practice.

Studies of the occupational exposures and the experiences of several groups of professional and other workers have been reported during recent years. In order to appreciate the significance of the dosages recorded we may remind ourselves that the maximum permissible weekly dose for whole body exposure to external sources of radiation is 300 milliröntgens (or 300 millirems) to blood-forming organs, gonads and eyes. Further, it is considered that the cumulative doses for whole body exposure should not exceed 3·0 röntgens (or 3·0 rems) to the blood-forming organs, gonads and eyes in any period of 13 consecutive weeks, or 5·0 röntgens (or 5·0 rems) per year.

Osborn (1955) found that at the University College Hospital, London, the average diagnostic X-ray worker received about 0·06 röntgen per week, whereas the average radioisotope worker received about 0·005 röntgen per week.

The Committee appointed by the Medical Research Council (1956) has pointed out that since doses of radiation which are of no known significance to the individual may have genetic consequences, exposure levels must be expressed in terms of the total dosage to the gonads received by the population as a whole during the period of reproductive life.

The Committee has estimated that, in Britain, an individual receives, on the average, a total gonad dose of about 3·0 röntgens over a period of thirty years from natural sources. They have also estimated that the average gonad dose for both male and female medical, industrial and research workers is about 2·5 röntgens per year, and that the average dose to employees of the Atomic Energy Authority is 0·4 röntgen per year.

Valaer and Zavon (1957) made a survey of the radiation exposure of 44 pædiatricians in Cincinnati, who used fluoroscopes in their practice. The radiation dosages which they received ranged from less than 50 milliröntgens in a week (31 physicians) to 210 milliröntgens per week. Five physicians revealed some evidence of radiation damage to the skin of the hands or feet or both.

Messite, Troisi and Kleinfeld (1957) examined 57 veterinarians, who employed fluoroscopy, for evidence of radiation injury. Fifteen had striations and splitting of the finger nails, and nine had skin lesions such as erythema, ulcers, keratoses and epithelioma. No striking hæmatological findings were recorded. In an earlier environmental survey of the establishments involved, Abrahams and his colleagues (1956) reported that measurements of the intensity of the radiation and estimates of the duration of exposure revealed the existence of potentially hazardous conditions in a considerable proportion of cases. Sullivan *et alii* (1957) have also made a survey of the radiation exposure in the veterinary profession.

Clinical Effects of Radiation.

We may summarize the known effects of occupational exposure to ionizing radiations as follows. (i) Skin lesions, such as erythema, burns, dryness and cracking, loss of hair, chronic dermatitis, ulceration, distortion of nails, loss of fingerprint patterns, hyperkeratosis, warts and, most important, malignant changes. (ii) Cataract formation of the lens of the eye, especially from neutron irradiation and also possibly from large doses of beta, gamma and X radiation. (iii) Degeneration, necrosis and malignant disease (sarcoma) of bones as a result of deposition of radioactive substances. (iv) Damage to the blood and blood-forming tissues, leading to severe and fatal disease such as aplastic anæmia and leukæmia. Less severe and reversible changes in the blood may occur with smaller doses. (v) Cancer of the lung from inhalation of the radioactive gas, radon, and other daughter products of radium. The inhalation of radioactive material in particulate form is also a possibility. Other effects of radiation include temporary or permanent sterility or impaired fertility as a result of damage to the gonads, and there is the very important risk of serious genetic effects if a sufficiently large proportion of the population becomes exposed to excessive radiation. There is also some evidence from observations on animals that irradiation may cause some shortening of the normal life span.

The abnormalities listed mostly come within the category of delayed effects of exposure to radiation, and these represent the important problem in occupational and industrial exposures.

Because of the great emphasis being placed on radiation protection, it is reasonable to expect that the future occupational incidence of severe, delayed effects or of acute effects should be of no significance, provided no major accident or other unexpected event occurs.

Precautions and Protective Measures.

The main objectives are first, to prevent deposition of radioactive materials in the body as a result of ingestion, inhalation, or absorption through the skin; secondly, to reduce to the lowest practicable level the exposure of the body to external radiation. Every attempt should be made to reduce the average weekly dose received by personnel to a figure well below the maximum permissible levels, and the chief measures necessary to achieve this are as follows: avoid unnecessarily powerful sources; conduct manipulations as rapidly as possible and adopt safe handling techniques; maintain adequate distance from the source; use protective barriers and screening materials of various types, remote controls, interlocking devices and warning signs, and protective clothing when necessary.

Where there are risks of inhalation or ingestion of radioactive material the precautions applicable to other toxic hazards of industry must be instituted and strictly maintained. The monitoring of workplaces and the safe disposal of radioactive waste materials are also essential. Persons engaged on work with sources of ionizing radiation should have some appropriate training. Personnel monitoring by means of film badges and in certain instances by pocket ionization chambers should be undertaken. Health supervision measures are also necessary. These usually include pre-employment and subsequent periodical physical examinations, the controversial blood count, and in some cases special tests of urine or exhaled breath.

Reference has already been made to some maximum permissible doses of radiation, the values for which are listed in a Code of Practice recently prepared by the Radioactive Substances Standing Advisory Committee (1957). The Code also sets out the following limits for maximum permissible cumulative doses to blood-forming organs, gonads and eyes, and for whole-body exposure for increasing periods of time. In any period of 13 consecutive weeks the permissible cumulative dose is 3·0 rems; up to the age of 30 years, 50·0 rems; after the age of 30 years, 50 rems per decade; in a lifetime, 200 rems.

The Code points out that the limits applicable for exposure up to 30 years and per decade thereafter are equivalent to an average weekly dose of 100 millirems (i.e. one third of the maximum permissible weekly dose), and that in the case of long-term exposure the protection must be planned accordingly.

Uranium Hazards.

It is necessary to say a few words about the health aspects of uranium mining and processing in view of the development of this industry in Australia.

Not only is there the radioactivity hazard, due chiefly to radon gas and its daughter products Radium A and Radium C^1 and the risk of lung cancer, but also, according to Hodge (1956), uranium itself is a poisonous substance and can cause injury to the kidneys: it is one of the most toxic elements chemically, but providentially it is absorbed into the body only with difficulty. He claims that uranium deposition of bone is no radiological hazard, for toxic effects of uranium on the kidney would be fatal long before enough uranium was absorbed into the body to give a radiologically hazardous concentration in the bone. Eisenbud and Quigley (1956), on the other hand, conclude, on the basis of experience with severe exposures to both soluble and insoluble compounds, that uranium has a low order of chemical toxicty in man.

Another hazard is that due to pneumoconiosis-producing dust; if, for example, uranium ore is associated with siliceous rock structures its extraction may be associated with exposure to dusts capable of causing silicosis.

The conscientious application of sound industrial hygiene measures is the essence of control of hazards in the uranium industry.

Legislative Control of Hazards.

In Australia, the first move towards the introduction of legislation for the control of occupational radioactivity hazards on a national basis was made in 1950, when the Industrial Hygiene Committee of the National Health and Medical Research Council submitted a resolution to the Council that appropriate legislation should be introduced in all States. The Committee was then asked to prepare a model Bill, which, upon completion and after acceptance by the Council and other interested organizations, was referred to the States as the basis for uniform enactments.

Prior to that time the only pertinent State legislation in operation comprised regulations in both Victoria and New South Wales in respect of the manufacture and use of radioactive luminous paints and, in Victoria, regulations governing the use of X-ray fluoroscopes in shoe fitting.

Artificial radioisotopes used in this country are obtained from overseas, and since 1951 their importation into Australia and that of radium and any other radioactive material has been prohibited under the Customs (Prohibited Imports) Regulations, unless approved by the Commonwealth Director-General of Health. In practice this approval is given through the Commonwealth X-Ray and Radium Laboratory, subject to compliance by the importer with certain conditions.

To the time of writing (March, 1958) three States of the Commonwealth have enacted a Radioactive Substances Act, and a fourth has amended an existing Health Act to provide for control over radioactive substances and irradiating apparatus. The enactments are based upon the model Bill prepared by the Industrial Hygiene Committee, which provides, *inter alia*, for the constitution of a Radiological Advisory Council, and for the licensing, with certain specified exemptions, of persons who possess, use, sell, supply, purchase or store radioactive substances or irradiating apparatus. No State has yet issued regulations under its appropriate Act, but model regulations have been submitted to the States. These relate to the issue of licences, to the sale, purchase, safe storage, use and disposal of radioactive substances, to construction or structural alterations of buildings, to maximum permissible levels of radiation, to the provision of warning signs and labels, to the prevention of injury by ionizing radiations to any person, to medical examinations of exposed personnel, to the transport of radioactive substances, and to the safe disposal of radioactive waste material.

In Australia, because the Commonwealth lacks the necessary constitutional powers, the administration of radiation legislation is in the main a State responsiblity, so it is obvious that there should be basic uniformity in the main principles and intention of the statutes. It may also be argued that, in addition to the State enactments, there should be appropriate Commonwealth legislation for application to the Territories and to Commonwealth institutions and employees therein. Whether legislation is introduced at State or Commonwealth level it is essential that it should be workable. Laws that cannot be complied with or enforced are of little use, and of course they should not be so rigid or restrictive as to impede progress in the uses and applications of atomic energy. There is already in operation Commonwealth legislation in respect of the transport of radioactive substances by aircraft and by the postal service.

Conclusion.

Jay (1954) expressed the opinion that there is no mystery about the effects of radioactivity, and no insurmountable difficulty in preventing people from being harmed by them. He asserted that, on the contrary, the control of health hazards in the atomic energy industry is so effective that the injury rate is much lower than that in most comparable industries, and that it is not too much to state that atomic energy offers one of the safest of industrial employments. It should be our constant aim to ensure that those statements will always be as true as they were three or four years ago.

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THE RADIATION HAZARD AS IT AFFECTS MEDICAL PRACTICE.[1]

By H. A. S. VAN DEN BRENK, M.S., F.R.C.S., D.T.R.,
Victoria.

THE discovery of Röntgen in 1895 opened a new chapter in medical practice. It revolutionized diagnosis and treatment. Today, the practice of radiology has gained renewed vitality with the advent of the "nuclear age", and with the production of new sources of radiation energy designed to provide physical dosimetry in tissues, and qualities previously not available. Initially, the advent of the invisible rays heralded certain fears that mankind's modesty would be placed in jeopardy; today, our fears assume a more serious character. The question of radiation hazards occupies the mind of every responsible radiologist and practising physician. Modern medicine is based largely on scientific methods. The evaluation of a therapeutic hazard requires a similar disciplined approach, and must be guided by all available scientific information. The final decision, often difficult to make, will demand clarity of outlook in the evaluation of probable gain and loss to the patient and to the community.

It is unfortunate that certain publicity, often ill-conceived, has been focused on radiation hazards, often lacking the realism necessary to prevent an unbalanced concern with which the public may react to incomplete data and hasty views, only partly rationalized. Our assessment of the radiation hazard to man, of necessity must be made on the results of much research on radiation effects in a multitude of experimental fields. Not only are approximations, extrapolations and assumptions necessary evils to reach some finality of thought, but also the whole question of the radiation hazard is largely divorced from changes in the environment of man in other respects, which make control values somewhat doubtful. These considerations must make it abundantly clear that not only is the assessment of the whole question beyond the scope of a single trained individual, but also dogmatic opinions, often not free from bias, are a source of mischief, which may seriously affect the beneficial use of ionizing radiations, particularly in the medical sphere. It is fortunate that a balanced report, by an illustrious group of scientists and practising doctors (Medical Research Council Report, 1956), made in the best traditions of British medicine and science, is now available.

The purpose of this short paper is to present some elementary but fundamental considerations in respect to ionizing radiations, with special regard to radiation hazards as they affect medical practice.

Dose-Effect Relationships.

For a given effect due to a particular type of stimulus, radiation or otherwise, the quantitative relationship, which exists between the magnitude of the energy employed and the magnitude of the effect produced, is fundamental. For the accurate establishment of this relationship, we require data which encompass the entire range of dosage to which exposure of the individual may reasonably be expected. Such data, represented graphically, usually take the form of one or the other of two curves. In one curve, the exponential or "non-threshold" curve, the smallest finite dose results in an effect; in the other, the sigmoid or "threshhold" curve, before an effect is produced a certain threshold of energy must be exceeded. Such curves are best plotted on a semi-logarithmic scale. The decision as to whether a threshold exists and the magnitude of this threshold is often difficult to establish, even in controlled experimental material. For the lower dose range in which we are particularly interested in relation to radiation hazards, direct experimental determination of the dose-effect relationship is statistically difficult, owing to experimental error, and in this range of values assumptions are often made by the drawing of theoretical curves, and by the extrapolation of data. In this way an exponential relationship may be considered to hold when, in fact, a small "shoulder" or threshold exists, which is sufficient to invalidate assumptions regarding, for example, a genetic hazard due to occupational or some other form of radiation exposure.

However, radiobiological theory supported by very extensive experimental evidence points to a non-threshold, cumulative effect of ionizing radiations in genetic mutations in lower animals, and in certain somatic changes in simple living models (e.g. viruses). This conclusion is based on (i) the exponential shape of survival curves, (ii) the independence of the fractionation of a dose and the intensity of a given dose on effect, (iii) the effect of linear energy transfer or the ionization density of the radiation on the effect produced, and (iv) the effect of changes of temperature of the irradiated medium. To what extent there is justification in applying such arguments to higher organisms and man remains problematical, but, in the face of uncertainty, it seems necessary to accept the vast body of scientific opinion which favours a non-threshold effect of ionizing radiations on genetic material.

Genetic Hazards.

Mutations of individual genes occur spontaneously with a frequency of 10^{-5} or 10^{-6} per generation. The most reliable measurement is based on direct observation, where the gene studied is detectable with certainty or regularity in heterozygotes. The deleterious dominant traits (e.g. chondrodystrophy and retinoblastoma) and sex-linked inheritance in hæmophilia provide the most reliable data. Indirect estimates of spontaneous mutation rates on the assumption of recessive inheritance have been made for several disease states in which heredity plays an essential role (e.g. total colour blindness, albinism, juvenile amaurotic idiocy, etc.). This subject is admirably reviewed by Penrose (1957).

Müller, in 1927, discovered that ionizing radiations induce mutations at a rate greatly in excess of the spontaneous rate. The information supporting this conclusion is experimental and stems from results with micro-organisms and certain insects. Müller's researches and the researches of others support the opinion that radiation mutagenesis is cumulative and that the dose-effect relationship is non-threshold in type.

For man, the probable sensitivity of human loci to radiation has been calculated, using the experimental data on lower animals as a basis for comparison. However, direct observations are essential, and certain sources of information are at present available for study (Penrose, 1957).

1. Potential sources of information are the offspring of parents in the bomb-exposed Japanese population, the children of radiologists, patients who have received high doses to the gonads during radiotherapeutic treatments, and the children of populations subject to high natural background radiation. So many sources of error arise, and the incidence of known recessive traits is so low (less than 1%) that results are likely to be inconclusive, despite the collection of data in enormous quantities.

2. The parental history in known instances of mutation requires careful study of individual histories of parents and grandparents, for diseases in which mutation is the suspected cause (e.g. mongolism, retinoblastoma, chondrodystrophy). A modification of this study is the simple test of parental age, or the assumption that the older the parent the more likely that he or she has been subjected to mutagenic influence. Thus, at 40 years of age, the background radiation received is twice that at the age of 20 years, and the mutagenic effect should be proportionately increased. An analysis of male and female parental ages shows that the expected increase in parental age observed over control subjects is not statistically significant for

[1] Read at a meeting of the Section of Radiology and Radiotherapy, with the Section of Public Health, Industrial Medicine and Hospital Administration, Australasian Medical Congress (B.M.A.), Tenth Session, Hobart, March 1 to 8, 1958.

cases of epiloia, neurofibromatosis and retinoblastoma. In chondrodystrophy and acrocephalosyndactyly, a marked increase in the parental age is confined to the male parent, whilst for mongolism the reverse holds. This suggests respective different causes for such fresh mutations, which on the evidence available are other than radiation induced.

3. If the change in a cell from normal to malignant is a somatic mutation, a study of the dose-effect relationship for experimental radiation carcinogenesis should point to a correlation with radiation mutagenesis. The studies of Court Brown and Doll (1956), on the incidence of leukæmia in cases of ankylosing spondylitis treated with radiation, are suggestive of an exponential relationship similar to X-chromosome lethals induced by ionizing radiations in *Drosophila* and will be discussed later.

4. A given dose of radiation produces chromosome breaks more readily in the X chromosome than in the Y chromosome. Experimental results support theoretical calculations, that the sex ratio (males : females) of progeny of irradiated males mated with unirradiated females is lowered. Examination of the sex ratio of progeny of humans who have received doses of radiation has given conflicting results. Neel *et alii* (1953) found that therapeutic pelvic irradiation of the male parent increased the sex ratio for the progeny, whilst the reverse obtained for irradiation of female parents. On the other hand, in an analysis of 80,000 pregnancies in Hiroshima and Nagasaki between 1946 and 1953, there was no definite difference in the first generation sex ratio, in the number of stillbirths, in birth weight, in neonatal death rate, or in abnormalities due to dominant mutant alleles (Neel and Schull, 1956).

In assessing the genetic hazard due to radiation mutagenesis a further factor requires consideration. Whilst it is held generally that all mutant alleles are detrimental, some genes which cause serious diseases in the homozygous state have been kept relatively common by a selective advantage of the gene when heterozygous. The study of the inherited sickle-cell trait in relation to malaria (Allison, 1954; 1956) has shown that this change, due to abnormal hæmoglobin S, is as high as 40% in East African communities where subtertian malaria is hyperendemic. This is due to the fact that individuals who are heterozygous for the sickling gene are more than usually resistant to the malarial parasite. In view of the statement in the Medical Research Council Report (1956) that there is no evidence and little likelihood that radiation produces new types of genes, but that it may increase the mutation rate of known traits, the latter could favour survival in instances where the heterozygous state confers a selective advantage.

However, the Medical Research Council Report, based on available experimental and human evidence, submits that a dose of 30*r* to 80*r* to the gonads of fertile individuals spread over a thirty-year period causes a doubling in the mutation rate. This is compared with a lifetime exposure at present levels of radiation of 3*r* to 4*r*, of which about 15% (0·6*r*) is due to the diagnostic use of X rays, 75% (3*r*) due to background radiation and the remainder due to other causes. Whilst the diagnostic radiation contribution represents a respectable percentage of the total, and theoretically should be kept to lowest levels, it is clear that a reasonable approach should be adopted to the whole question, before curtailing the increasing usage of diagnostic radiography and its immediate value to the patient. I submit the following points for consideration.

1. It is only the gonad dose contribution of a diagnostic procedure which carries genetic effects. There is no evidence available that extragonadal irradiation has an indirect mutagenic effect on the gonads.

2. Using data provided by Martin (1957), which show that whilst 67% of diagnostic examinations made in this country per annum involve lower extremities or structures above the diaphragm, this bulk of diagnostic examinations contributes only 0·95% of the total gonad dose contribution from all diagnostic X ray examinations, that is, taking the present lifetime total diagnostic contribution as 0·6*r*, these extraabdominal examinations contribute 0·006*r*. For comparison, luminous watches contribute a population dose of 0·03*r*. It seems clear that a marked increase in extrapelvic-extraabdominal radiography, above current practice, is compatible with safety on genetic grounds, particularly if it is realized that simple gonadal shielding as a routine would further reduce the gonadal contribution tremendously, especially in males.

3. The major gonad dose contribution (99%) arises from examinations of abdominal viscera, lumbar vertebræ, pelvis and hip bones. Such examinations are usually undertaken in patients with disabling and serious complaints, many of which may be a threat to life, and in which radiology is essential for diagnosis and consequent medical management. The examinations are most frequently made in patients beyond the age of reproduction, and hence a large proportion carry no genetic hazard. Of the remainder, who are still active genetically, in 50% (males) the use of a testis shield as described by Martin and Evans (1957) reduces the gonadal dose by a factor of at least 90%. This leaves a very small fraction of patients, mostly females, which supposedly accounts for the bulk of radiation mutagenesis in the population due to sources other than background. However, even in this section, average fertility is probably lower than normal, and the very nature of the age of the patient and the type of investigation required suggests that serious illness is suspected and diagnosis may be a matter of life or death. Whilst it is clear that gonadal exposure should be limited if possible in such patients particularly, on the evidence available, diagnostic accuracy for the individual must clearly supersede genetic hazards to the population, and the radiologist has a clear obligation to the patient to make his examination with all possible accuracy. Whilst the Medical Research Council Report, based on the work on Stanford and Vance (1955), allows for age distribution in the calculation of the "genetically significant radiation" due to diagnostic radiology, and the doses received are weighted accordingly, a detailed presentation of reasons for the use of pelvic and abdominal radiology in the genetically significant age group is really needed to provide an assessment of fertility. Such patients are presumably disproportionately diseased, and major radiographic procedures have been deemed necessary, on individual grounds.

4 In view of the preceding remarks, it seems unscientific and dangerous to curtail radiographic practice in general, and in particular specialized techniques such as tomography and arteriography, which are almost invariably employed in seriously ill patients. It also indicates how absurd it would be to curtail mass chest radiography on genetic grounds.

5. The suggestion frequently made, that the population be issued with identity cards, requiring entry of radiological exposures, may be interesting for the collection of scientific data, but it is frightening. Such a measure may attach a stigma to radiography, which the uninformed individual is unable to assess logically, and will deter early and accurate diagnosis of disease—the basis of scientific medical practice.

Radiation Leukæmogenesis and Carcinogenesis.

That ionizing radiations are leukæmogenic is based on the findings that the incidence of leukæmia was increased in the Japanese atomic bomb casualties, in radiologists, in children subjected to pelvic diagnostic radiography *in utero* and in cases of ankylosing spondylitis treated with X-ray therapy. Added to this is the correlation of the increase in leukæmia in a population with the increasing use of diagnostic radiology and radiation exposure from other sources, and, furthermore, the large body of experimental evidence dealing with radiation leukæmogenesis in animals.

Whilst it seems reasonable to accept that ionizing radiations contribute to the increased incidence of leukæmia in man, the more exact features of the relationship are open to doubt. It seems clear that, in patients suffering from ankylosing spondylitis, irradiation

determines a tenfold increase in the incidence of leukæmia, from 0·3 per 1000 in persons who have received no radiation, to three per 1000 in those who have been irradiated and that a dose of 30*r* to 50*r* administered to the whole marrow may reasonably be expected to double the incidence of leukæmia in man (Court Brown and Doll, 1950). However, the working hypothesis, suggested by Court Brown and Doll, that the incidence of leukæmia bears a simple proportional relationship to the dose of radiation, and that there is no threshold dose for the induction of the disease, involves several approximations, which may be subject to appreciable error, and other dose-effect curves are also compatible with the data. A simple linear relationship can only be reasonably applied to the effect from whole body integral dose, whilst plotting of the effect of the maximum spinal dose seems to give a threshold curve. This is of considerable practical importance in that most radiographic and indeed radiotherapeutic procedures are regional. For ankylosing spondylitis, the practice employed in the United Kingdom of irradiating the whole spine is used much less frequently in this country. One must also question the patients with ankylosing spondylitis, who have received no radiation and who are used in the analysis. It is difficult to conceive of cases of true ankylosing spondylitis which never received radiation. The disease is of such a crippling nature, frequently associated with anæmia, pulmonary tuberculosis and ulcerative colitis, and in itself may be lethal, that the help of irradiation in its control has almost invariably been necessary. To withhold therapeutic irradiation in this disease on the basis of a tenfold risk of leukæmia developing is unreal, and indeed the common-sense attitude of Witts (1957) is refreshing, and is a pointer to the appraisal of radiation hazards in general. He states:

> The possible 50 cases of leukæmia a year from X-radiation *in utero* must be set against 439 deaths of mothers in childbirth, 15,829 stillbirths and 9,750 deaths in the first week of life in 1955. Obstetricians and radiologists believe that the mortality of mother and child may be significantly reduced by appropriate X-ray examinations in pregnancy and that they can save more lives than are likely to be lost from leukæmia, appreciating as they do now the hazards of X-radiation. Similarly, the death rate from leukæmia after radiotherapy for ankylosing spondylitis is only 3 per 1000 and . . . is a good deal lower than the mortality of 13 per 1000 for interval partial gastrectomy for peptic ulcer in the best hands.

In respect to the justification for the use of X-ray pelvimetry in obstetrics, Hartley (1957) has listed several clear-cut indications, in which the information provided by radiography cannot be ignored on the grounds of the radiation hazard to mother and fœtus. Whilst the radiologist and radiotherapist must exercise reasonable care against causing over-exposure, which is likely to effect genetic and somatic consequences in the individual case, in the writer's opinion, recklessness has not attended radiological practice even prior to the publicity which accompanied the "atomic awakening". The outcry that radiotherapeutic treatment of inflammatory conditions is an unjustifiable genetic and carcinogenic hazard is ill-founded. In such conditions radiation in small dosages is usually employed when fields of significant size are irradiated and when other methods fail to provide effective palliation or cure. Even today irradiation is justified in such circumstances. A closer understanding of the relation of radiation to the induction of malignant change in certain conditions is being achieved. It would seem, for example, that in the "benign" osteoclastoma of bone, radiation treatment, efficacious in causing resolution, is often followed by delayed malignant change. Personal studies indicate that repeated protracted courses of irradiation may be the precipitating factor. Again, the vascular nævus in children appears better treated by other methods, although radiation still has a place in the management of complications, and the radiation hazard feared in this particular instance (carcinogenesis) has not been demonstrated to offset the values of treatment.

In seeking to define the dose-effect relationship for radiation carcinogenesis, experimental studies clearly point to a threshold relationship for regional irradiation. Whilst my own studies have indicated that local irradiation of the skin of rats with a large single dose of soft X rays of 4000*r* produces a high yield of epitheliomata and soft tissue sarcomata, in or about the irradiated volume, halving of the dose (2000*r*) is attended with the zero incidence common to unirradiated animals of similar strain. Similar results have been published by Boag and Glucksmann (1956) for electrons accelerated in a Van de Graaff generator, a single dose of 2300 rads of β rays failing to induce tumours. Clinical evidence in humans supports these findings. The very rare "radiation sarcoma", which results from intensive irradiation of the skin and underlying tissues, occurs in atrophic scars produced by intensive irradiation, often after repeated radionecrotic episodes. The occurrence of a new growth, circumstantially attributable to therapeutic irradiation, readily gains access to the medical literature, and indeed, correlated with experimental results, the "target" theory of ionizing radiation damage and the concept of somatic mutations give rise to the argument that no good can result from the use of an attested carcinogen in the treatment of a cancer. A further argument may be advanced that no known treatment substantially affects the "cure rate" in cancer. The rationale of this approach is not clear. The results of medical treatment must surely be assessed in the number of life-years, compatible with comfort and social usefulness over the period of survival. The term "cure" has no absolute meaning. Palliation itself takes on a real value in the management of disease, and the usefulness of radiological diagnosis and therapy in this regard is obvious to any experienced clinician.

An aspect of radiation carcinogenesis, which is of importance, relates to the differences observed in tumour induction, with age and other physiological factors. Recently, Owen *et alii* (1957) have shown that the injection of a massive dose of ^{90}Sr (500 to 1000 microcuries per kilogram) in rabbits only produces abnormalities of hæmopoiesis and radiation osteosarcomata at certain ages. They found that animals six to eight weeks old were far more susceptible to radiation damage than either younger or older animals. Animal experiments, dealing with radiation-induced abnormalities in offspring which had been irradiated whilst *in utero*, also suggest a critical radio-sensitivity during early gestation. In humans, some suggestive but inconclusive results of irradiation of the neck during the treatment of thymic hyperplasias suggest that the thyroid also may be abnormally subject to radiation carcinogenesis in early infancy. It is difficult to reconcile such findings with a simple "single hit" target hypothesis for radiation carcinogenesis. However, useful practical information may result from a careful study of suitable available data, in relation to special hazards of ionizing radiations at certain periods of development, of the fœtus and the child.

Conclusions.

The practising radiologist and radiotherapist are faced with the problem of seeking to provide the maximum benefit to the individual without significantly endangering the genetic equilibrium of the population. It is probably true that every röntgen received by the fertile individual adds to the genetic load, although, at present levels of radiation exposure spread over the whole population, safety limits are respected.

There is a clear distinction between the genetic hazard incurred by the medical use of ionizing radiations and the hazard of leukæmogenesis and carcinogenesis. There is no acceptable evidence available that regional radiation procedures, either diagnostic or therapeutic, proportionately increase the incidence of leukæmogenesis and carcinogenesis according to the magnitude of the dose received locally, on the hypothesis of a "non-threshold" effect. According to Court Brown and Doll's data, a dose of 500*r* to the spinal marrow increases the natural

incidence of leukæmia fourfold, and carries with it a respective mortality of about 0·10%. The spinal marrow, during an extensive radiographic examination of the abdominal viscera, probably receives not more than 5*r*, and, on a "non-threshold" basis, carries a theoretical, if highly questionable, mortality from leukæmia in the region of 0·001%. We must ask ourselves, is this prohibitive, in the diagnosis of conditions such as peptic ulceration, renal calculus, malignant diseases, etc. In the opinion of the writer this risk must be accepted realistically, and even a mortality of 0·2%, corresponding to doses of 3000*r* and over—the highest doses to the spinal marrow likely to be incurred in the radiotherapeutic treatment of debilitating non-malignant conditions—is justifiable if the treatment affords substantial relief of symptoms, unobtainable by alternative means free of this hazard. The mortality risk from radiation sarcomata and cancers is only a relevant risk in the radiotherapeutic treatment of certain benign conditions, or low grade malignancies in young patients, where high dosage is employed. This mortality in even the most unfavourable circumstances is still extremely low, and, before it reaches practical significance, much more extensive and systematic data are necessary in relation to hazards and results of all types of treatment available to such patients. However, it would appear that, when possible, high dosage and prolonged fractionation of radiation should be avoided in children and young adults.

The genetic hazard, on the other hand, requires a different approach by the radiologist. Here, the nature of the hazard and its effect on future generations is not clear, and we cannot think in terms of an absolute value such as mortality. We are forced to accept indirect calculations and extrapolations, which, put in practical terms, arrive at a cumulative dose value for a specific fertile life span, and are based on a predicted doubling of the spontaneous mutation rate and its effect on the genetic equilibrium of the race of the future. We do not know what would be the effect of doubling the spontaneous mutation rate in man, and are even less sure of the ethical values involved in the choice between a definite immediate gain to the individual and an indefinite remote genetic upset. Whilst we may have our individual opinions and misgivings, we should be grateful to the Medical Research Council for their somewhat magical conclusion (reached with some reservations) that it is safe on genetic grounds, for not more than 2% of the population, to receive a total dose of 50*r* to the gonads from conception to the age of 30 years, in addition to the radiation received from natural background. It would seem that the medical use of ionizing radiations, at present levels carries only a significant genetic hazard for certain pelvic procedures, and the present risk of disturbing the genetic equilibrium of future populations is negligible.

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THE EARLY DIAGNOSIS OF PORTAL HYPERTENSION.[1]

By GEORG BERCI, M.D.,[2] GEZA FOLDES, M.D., TIBOR HERCZEG, M.D., AND DEZSO LEHOCZKY, M.D.,

Budapest.

DURING the last decade recurrent and chronic hepatitis and cirrhosis have been recognized more frequently and this has inevitably stimulated a search for any methods which will lead us to an earlier and more reliable diagnosis of portal hypertension. Physiologists and clinicians alike are deeply concerned with the changes in the portal circulation brought about by the intrahepatic and extrahepatic blocks, which in turn precipitate the development of a porta-systemic collateral circulation.

At the present stage of our knowledge an exact diagnosis can be established only when these compensating collaterals have developed or later when symptoms of what we may call (from analogy with cardiac disease) "decompensation" of the portal circulation are already in evidence. Most patients with cirrhosis will, if treated, survive only one to two years from the time of the first symptom. Magyar (1956) claims that survival for four to six years after the diagnosis is first established is exceptional. The most frequent causes of death are acute liver insufficiency, hepatic coma and bleeding from varices (Wanke, 1955). A percentage, which varies in different series from 15% to 50%, will come under treatment for hæmorrhage, and of these 25% to 80% will not survive the first year. In many instances the immediate cause of death is an intercurrent disease or heart failure. Cirrhosis and tuberculosis often go hand in hand: 12% to 14% of cirrhotic patients have tuberculous infection, and in them it often progresses rapidly to a fatal outcome (Kalk, 1956).

Unfortunately, the liver function tests in current use do not yield adequate information about the pathological process in the liver; in particular, they reflect in no way the changes in the hæmodynamics of the hepatic circulation. In 30% of patients with chronic hepatitis and in 15% of patients with cirrhosis liver function tests will give normal results (Kalk, 1955).

It is highly desirable to be able to establish the diagnosis at the stage when chronic hepatitis is turning into cirrhosis. It may well be that the first evidence of this transition will be a rise in portal venous pressure, and that we should aim at its detection at a very early stage, long before there is clinical evidence of a developing collateral circulation. To enable us to follow changes in portal vein pressure we must have some readily available method which does not require an operation. Such a method seems now to be available, but before discussing this technique and its application we wish briefly to mention some of the problems of the hepatic circulation in health and in disease.

The blood from the stomach, small and large intestines, gall-bladder, spleen and pancreas passes to the liver in the

[1] This work was carried out in the Department of Surgery, Postgraduate School, Budapest, Hungary, under Professor B. Molnar.

[2] Presently working in the Department of Surgery, University of Melbourne, and in receipt of a research grant from the Rockefeller Foundation.

portal vein. This divides in the same way as does an artery, and its ultimate distributaries open into the sinusoidal system of the hepatic lobule. The terminal branches of the hepatic artery end in the same way. From the sinuses blood is collected first along the central veins and ultimately into the hepatic veins and so back to the inferior vena cava and the right side of the heart. It will be apparent, therefore, that the sinusoidal system is a system in which there is equation of different pressures (that of the hepatic arterial system, of the portal venous system and of the hepatic venous system).

If somewhere in the sinusoidal system the circulation becomes blocked, as for example by narrowing of the lumen, the circulation becomes slower and the pressure at some point rises. Depending on the site of the obstruction (its exact position is in most cases determined by the underlying pathology) we distinguish clinically intrahepatic and extrahepatic blocks. The latter may be either pre-hepatic or post-hepatic. In 70% to 90% of cases the block is intrahepatic (Markoff, 1954; Saegesser, 1956).

Not only do the hepatic artery, the hepatic vein and the portal vein open into a common capillary system, but also they are joined together by presinusoidal connexions which function as intrahepatic shunts. When there is either disordered function or stricture of the sinusoidal system, as for example in cirrhosis, a proportion of the blood from the hepatic artery and the portal vein does not pass through these sinusoids, but circulates directly into the hepatic venous system, where under these circumstances resistance may be lowered. It seems that proliferation of connective tissue in the vicinity of the sinusoids may in some way interfere with their ability to equate the different pressures. It is certainly true that portal hypertension, which is primarily due to a rise in hepatic resistance, is still more increased by arterial pressure. This was borne out by the experience of Herrick (1907), and by Wanke (1955) and others, all of whom reported that in patients with portal hypertension the pressure fell after ligation of the hepatic artery.

The most frequent cause of portal hypertension is cirrhosis. The obstruction, which is presumably caused by an increase in the amount of connective tissue, may affect the intrahepatic blood flow at almost any point. Wherever this may occur the result is the same, namely, there is a rise in intrahepatic vascular resistance, with a resulting decrease in the speed of circulation, a rise in pressure and later the development of porta-systemic anastomoses. The compensating collaterals develop at the upper end of the fore-gut, in the rectum, at the umbilicus and in the retro-peritoneal tissues. The total cross section of this collateral network is usually considerably in excess of what can be achieved at operation by a porta-caval shunt (Eck's fistula). Why, under such circumstances, does the portal pressure seem sometimes to continue to rise? May it not be that the cause of the portal hypertension arises and develops much earlier than do the collaterals and that this primary cause proceeds so fast that the compensating mechanism cannot keep pace in the development of the new collaterals? At best these escape routes can deal with only a small part of the surplus pressure, and it is often only when they are overburdened and unable to contend with the situation that the diagnosis of portal hypertension is made for the first time. It is our belief that this is a late stage of the illness. The prognosis in such patients is certainly very poor.

A direct measurement of the pressure in the portal vein in man can be made only at laparotomy, and it would seldom seem legitimate to open the abdomen for this reason alone. This has led to a search for indirect methods of estimating the pressure. It was found, for example, that any increase of hepatic resistance caused a proportionate slowing of the portal circulation time. A variety of substances has been used to measure circulation time, including decholin, ether and calcium (Egeli Reimann, 1955). However, the end point was often exceedingly difficult to determine, depending as it did on subjective phenomena.

More recently attempts have been made to follow the changes in the quantity of blood circulating through the liver. These methods hitherto have had a wide margin of error, but it is possible that the use of radio-isotopes in this field may afford more reliable data.

Peritoneoscopy in the hands of those who have learnt this exacting technique may make it possible to see distended peritoneal and visceral veins as well as the surface of the liver.

We can also make use of porta-splenic venography. However, this method of investigation, although it affords precise evidence about the site of the obstruction and may help in the differential diagnosis between intrahepatic and extrahepatic blocks, gives only indirect evidence of the presence of hypertension and no measure of its degree. Radiological methods have also been employed to measure portal circulation time. Attempts have been made to measure portal pressure more directly by determining the pressure which it was necessary to apply to the rectal mucosa to empty the vessels. However, a much more precise method of measuring portal pressure directly has been introduced by Atkinson and Sherlock (1954). They believe that the pressure in the portal vein is transmitted to the pulp of the spleen, and they measured this pressure by its percutaneous puncture. The upper limit of normal by this method they considered to be 221 millimetres of water. In 11 cirrhotic patients the average value was 325 millimetres of water. However, this method does not give any information about the site of the block and it is not without risk in certain cases.

In 1951 Myers and Taylor first applied the valuable catheter techniques which had come to play such an important part in the accurate assessment of disorders of the heart in the diagnosis of liver disease. They elaborated a method of catheterizing the hepatic vein in animals. Friedmann and Weiner (1951) reported a similar method, but the first examinations on human beings were carried out by Paton, Reynolds and Sherlock (1953). In 1953 they reported their experience of 210 such catheter studies, all of which had been completed without complication. In a healthy person the average pressure was 88·4 millimetres of water. In contrast, cirrhotic patients gave an average reading of 286 millimetres of water. Krook and Overbeck (1955) and Soule and Leger (1956) reported similar results. There seems to be general agreement that the pressure recorded when a catheter is threaded through the heart into one of the branches of the hepatic vein in the substance of the liver is identical with that of the portal vein. This is easy enough to understand since there are no valves in the branches of either the portal or the hepatic vein. The validity of this method of measuring portal pressure was proved by work in the experimental animal as well as by matching pre-operative hepatic vein pressures against direct measurements taken in the portal vein at operation.

This method of measuring portal venous pressure is very similar to that used in measuring the capillary pressure in the lung. The technique is not a difficult one. The catheter is introduced into the cubital vein and, with the help of an X-ray screen, it is threaded through the right atrium into the inferior vena cava.

It is then possible in almost all cases by rotation of the catheter to coax it into the right (or less commonly into the left) hepatic vein. It is passed as far as it will go, at which stage the catheter begins to buckle slightly. The pressure at this stage is called the occluded hepatic vein pressure. The catheter is then withdrawn for about two inches (five centimetres). The tip of the catheter will at this point be lying free in the main branch of the hepatic vein. This pressure reading is known as the free hepatic vein pressure. It is also customary to measure the pressure in the inferior vena cava and in the right atrium. The pressure is measured using an electro-manometer or water-manometer, coupled to some form of direct recording appliance.

All the manipulations of the catheter are done with great care, and the heart's action is continuously monitored by an electrocardioscope throughout the investigation. There is, in fact, much less risk to the patient than in cardiac catheterization when there is instrumentation of the cavity of the ventricle, with the attendant risk of heterotopic beats.

TABLE I.

Case Records of and Tests Made on 14 Patients.

Case Number.	Age (Yrs.).	Sex.	History.	Diagnosis.	Tests.								
					Liver.	Spleen.	Liver Function		Serum Protein.		Pressure (Millimetres of Water).		
							Thymol.	Flocculation, *Gold.* Lugol.	Total Protein (*Grammes* per 100 Millilitres.	Albumin/ *Globulin* Ratio.	Hepatic Vein Occluded	Hepatic Vein Free.	Right *Auricle.*
1	49	F.	Acute hepatitis four years ago. Typical complaint.	Chronic hepatitis	+	−	6·2	++ ++ ++	8·1	1·4	190	155	75
2	65	M.	Chronic alcoholic of ten years' standing.	Cirrhosis and ascites.	+++	−	8	++ ++ ++	6·4	0·8	495	245	100
3	44	M.	Not jaundiced; dyspepsia for three years; loss of weight.	Chronic hepatitis.	++	+	8·8	++ ++ ++	7·4	1·8	75	45	35
4	35	M.	Not jaundiced; typical dyspepsia for five years	Chronic hepatitis?	+	++	6·2	+ ++ −	7	1·9	110	85	50
5	32	F.	Malaria; genito-urinary tuberculosis treated by long course of INH and PAS; dyspeptic for two years.	Cirrhosis? Splenomegaly.	++	++++	7	++ ++ ++	7·2	1	344	55	35
6	64	F.	Acute hepatitis seven years ago; dyspeptic for three years; loss of weight.	Chronic hepatitis.	++	−	8·4	++ ++ ++	8·6	1·5	85	40	5
7	36	M.	Acute hepatitis 12 years ago; dyspeptic for two years.	Chronic hepatitis.	+++	+	9	++ ++ ++	7	1·1	150	50	35
8	63	M.	Old gall-stone colic with jaundice; complaints after cholecystectomy.	Chronic cholangitis	++	+	2	−− −− −−	7·2	1·9	120	55	25
9	43	F.	Acute hepatitis two years ago; since then constant complaints.	Chronic hepatitis.	++	+	6	++ ++ ++	6·5	2·2	125	90	75
10	53	M.	Alcoholic since adolescence; complaints for two years.	Cirrhosis and ascites.	++	+	12	+++ +++ +++	7·5	0·5	300	100	—
11	49	M.	Examination not successful.										
12	37	M.	Not jaundiced; no history of alcoholism; complaints for three years.	Chronic hepatitis.	++	+	11	+++ +++ +++	7·8	1·4	265	50	15
13	51	M.	Alcoholic; complaints for one year.	Cirrhosis and ascites.	?	?	5	+++ +++ +++	5·6	1·4	334	70	35
14	40	F.	Gall-bladder with stones removed; after operation jaundiced on several occasions; now jaundiced.	Biliary cirrhosis.	+	+	1	−− −− −−	8	1·3	120	16	−30

We have carried out this examination on 14 patients (see Table I). In one it was not found possible to pass the catheter from the superior vena cava into the right atrium. In none of the others were any difficulties encountered and there were no complaints from the patients. When we had perfected our technique after our experiences with the first two patients the time required for the complete investigation was only 20 to 25 minutes.

Three of our patients had manifest portal cirrhosis with ascites, one had biliary cirrhosis, seven had chronic hepatitis, one had chronic cholangiitis and one had cirrhosis with splenomegaly.

The upper limit of pressure in the closed hepatic vein of normal subjects we consider to be 143 millimetres of water. In the three cirrhotic patients the pressure readings were 495, 334 and 300 millimetres of water. In the fourth case of cirrhosis with splenic enlargement the pressure was 344 millimetres of water and the diagnosis of cirrhosis and portal hypertension was first suggested by these manometric readings.

The clinical diagnosis in the patient with biliary cirrhosis was confirmed by biopsy. It is interesting to note that the portal pressure was normal (120 millimetres of water). It is clear from the literature that biliary cirrhosis seldom, if ever, results in vascular decompensation with the development of portal hypertension. Certainly collaterals or ascites are seldom seen in such cases.

In one of the patients with cirrhosis and gross ascites the removal of eight litres of ascitic fluid caused the hepatic vein pressure to fall from 334 millimetres of water to 260 millimetres of water. This supports the contention that the increase in intra-abdominal pressure in such cases in the presence of ascites causes in turn an increase of pressure in the occluded hepatic veins.

In the patient with cirrhosis and splenomegaly the intrasplenic pulp pressure, as measured at operation, was

345 millimetres of water. In seven patients with a clinical diagnosis of chronic hepatitis the pressure varied from 75 to 265 millimetres of water. (The normal upper limit of occluded hepatic vein pressure we take to be 150 millimetres of water.) In four of these patients the pressure was low, but in Case 12 the pressure was 265 millimetres of water, in Case 1 it was 190 millimetres of water and in Case 7 it was 150 millimetres of water.

In our patients with cirrhosis and chronic hepatitis we could find no quantitative difference in liver function as measured biochemically, and we came firmly to the conclusion that the data arrived at by measuring the pressure in the occluded hepatic vein are more reliable indicators of the degree of intrahepatic vascular resistance than are those obtained by the indirect methods of investigation which are commonly practised.

Conclusion.

It is our contention that neither the clinical picture nor liver function tests and allied biochemical investigations give us accurate information concerning the state of the portal circulation.

We believe that it will be possible by the newer techniques for measuring portal veinous pressure to recognize the development of intrahepatic vascular occlusion at an earlier stage and with greater certainty. This will allow effective medical treatment to be instituted earlier. Moreover, it is highly probable that we shall be able to establish the indications for operation at a much earlier stage than we do at present, with a reasonable expectation of being able thereby to prolong the patient's life more effectively.

The potential field of inquiry which is opened by this method of measuring hepatic vein pressure is very considerable, and further studies of this nature should give us a much better understanding of the hæmodynamics of the portal circulation in health and in disease.

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ANÆMIA AND NUTRITIONAL DISEASE IN NORTHERN TERRITORY NATIVE CHILDREN.

By J. M. CROTTY,
Darwin, Northern Territory.

THE present study was undertaken because of the high incidence of anæmia noted in aboriginal children admitted to the Darwin Hospital. An attempt has been made to estimate the incidence and ætiology of the anæmia. Previously, hookworm and unsatisfactory nutrition have been considered factors in this anæmia, but their exact role has not been determined. The present work consisted of two parts; first an investigation of the incidence of anæmia and the general nutritional state, and secondly a study in more detail of a group of anæmic children. A note is also made on the weights of a group of children followed for three years at a mission station. The age group of the children was from six months to 12 years. This group was chosen because experience showed that most of the anæmic children seen were in this age group.

All this work was concerned with natives living in an area north from about Katherine. In this area native customs as regards food, available diet, and climate are reasonably constant. The results obtained should be applicable to all this area, but south of it the available food, the customs and the climate vary so much that their application is much less certain.

The children in this northern area are breast fed till they are about 20 to 24 months of age or even older. The lack of available supplementary food means they are largely dependent on breast milk till they are weaned. The number to whom adequate diet supplements are available in the late breast-feeding period is increasing owing to the work of the missions and the Government settlements, but even then the native mothers often cooperate poorly. The diet of school children tends to be better since they are fed by the staff of the missions and the settlements, where they are attending school, with food prepared in the mission or settlement kitchen.

The diet from weaning till school age is variable. Usually foods are available at missions and settlements, but often only a small number of children is brought up to receive them. Sometimes they go to the bush with their parents and exist on "bush tucker". "Bush tucker" tends to be a high protein diet consisting of the day's catch at hunting, e.g. fish or wallaby or goanna, and a few berries and roots. Meat is often cooked by just being thrown on the fire till the outside is lightly cooked. In the bush food is eaten irregularly according to when it is available. The adult men do very well on this diet, but it is obviously

impossible to obtain from it a suitable diet for a recently weaned child.

The climate of the area is hot and humid. The hygiene of native camps is poor and lends itself to the spread of helminthic infestation and infectious diseases.

Method.

Survey of the Incidence of Anæmia and the General Nutritional State.

This survey was performed on 424 children who were seen on one-day visits to missions and government settlements. These children were all seen within 150 miles of Darwin on visits made in September, October and November of 1956. The places visited were Bathurst Island, Snake Bay, Bagot, Port Keats and Daly River.

Blood was collected from the children by finger prick, and the hæmoglobin value was estimated in Darwin by an oxyhæmoglobin method using a photoelectric colorimeter which is standardized at intervals by samples of known hæmoglobin value sent out by the New South Wales Division of the Australian Red Cross Society. The hæmoglobin estimations were always made within eight hours of collecting the blood and usually much sooner. This was possible because the visiting was done by the Health Department aircraft.

The heights and weights of the children were recorded on these visits.

Samples of fæces were collected from as many children as possible (284). A single Willis flotation test was performed on each specimen, and hookworm ova were looked for. Other ova were not recorded.

All the ages quoted are the ages of the children when they were first seen.

Study of the Group of Children in the Darwin Hospital.

These children were from amongst the most severely anæmic, and all were admitted to hospital because of this illness and not just to be studied. An attempt was made to determine the type and ætiology of each case of anæmia.

Results.

Survey of the Incidence of Anæmia and the General Nutritional State.

The number of native children in each age group, together with the average heights and weights of the children in each age group are shown in Table I. The average heights and weights of white children in the corresponding age groups, from Darwin and Alice Springs, are included for comparison.

TABLE I.

The Number of Native Children Studied in each Age Group, and the Average Heights and Weights of Native Children in each Age Group, Compared with the Average Heights and Weights of White Children in the Corresponding Age Groups.

Age (Years.)	Number of Native Children in Each Group.	Mean Height of Group (Inches).		Mean Weight of Group (Pounds).	
		Native.	White.	Native.	White.
0·5 to 1 ..	30	25·5	28·0	15	20
1 to 2 ..	33	28·5	—	19	—
2 to 3 ..	31	33·0	—	24	—
3 to 4 ..	47	36·0	39·0	28	33
4 to 5 ..	33	39·5	40·5	33	37
5 to 6 ..	44	43·0	44·0	36	42
6 to 7 ..	41	47·0	46·0	41	45
7 to 8 ..	37	47·5	49·0	45	51
8 to 9 ..	27	50·5	50·0	51	57
9 to 10 ..	27	51·5	53·0	52	63
10 to 11 ..	45	53·0	55·5	58	71
11 to 12 ..	29	56·0	57·0	66	78

Unfortunately figures for the heights and weights of Northern Territory white children aged between one and three years are not available. The figures for white children aged from three to 12 years were prepared by Dr. Helen Phillipps from Darwin and Alice Springs kindergarten and school children. The figures for children aged from six months to one year were prepared by the Darwin Infant Welfare Clinic.

The hæmoglobin values are shown at various ages in Table II. The standard deviation is also recorded to show that it is greater in the younger children. These are compared with the mean hæmoglobin values for New South Wales children (Walsh *et alii*, 1953).

TABLE II.

Hæmoglobin Values for Native and White Children (New South Wales Values) in Each Age Group.

Age (Years).	Mean Hæmoglobin Value of Native Children (Grammes per 100 Millilitres).[1]	Mean Hæmoglobin Value of N.S.W. Children (Grammes per 100 Millilitres).
0·5 to 1 ..	9·6 (2·7)	11·8
1 to 2 ..	8·4 (2·1)	11·7
2 to 3 ..	9·0 (2·0)	12·3
3 to 4 ..	9·0 (2·3)	12·7
4 to 5 ..	9·3 (2·0)	12·9
5 to 6 ..	10·8 (1·6)	12·9
6 to 7 ..	10·5 (1·4)	13·0
7 to 8 ..	11·2 (1·5)	13·2
8 to 9 ..	11·3 (1·6)	13·3
9 to 10 ..	11·9 (1·9)	13·6
10 to 11 ..	11·7 (1·4)	13·7
11 to 12 ..	11·9 (1·4)	13·7

[1] Standard deviation is shown in parentheses.

A comparison of the hæmoglobin levels at various ages of the 155 children found to have hookworm with the 129 children without hookworm is shown in Figure I.

The Children Studied in Hospital.

Twenty-eight children were in this group. Their ages on admission to hospital ranged from seven months to six years; however, 13 were aged between one and two years and five between two and three years. The signs and symptoms exhibited by these children were seen, in milder degree, in many children on the missions and settlements wno were not sick enough to be brought in to hospital.

These children were all fairly severely anæmic. The lowest hæmoglobin levels recorded were in two children who each had levels of 1·8 grammes per 100 millilitres; 12 children had levels between two and four grammes per 100 millilitres; the remainder had hæmoglobin levels between four and seven grammes per 100 millilitres. Of 23 children on whom the mean corpuscular hæmoglobin concentration was estimated, 12 gave readings below 25%, 10 between 25% and 30% and one above 30%.

Serum protein levels estimated by the copper sulphate method varied. Of 13 children on whom the estimation was performed, in five the result was between five and six grammes per 100 millilitres, in three between six and seven grammes per 100 millilitres, and in five between seven and seven and a half grammes per 100 millilitres.

Of 25 children whose bone marrow was examined, four showed a megaloblastic marrow at some time in their illness. However, two of these had shown a normoblastic marrow on their admission to hospital, and in one the marrow was not examined till treatment was well started and clinical improvement definite. The marrow of most of the children was examined soon after their admission to hospital only, and this was the time when they showed severe hypochromic microcytic anæmia. The majority of the marrows showed normoblastic hyperplasia.

Liver enlargement was an almost universal feature of the severely affected children and was associated with a "pot-belly".

Discoloured lifeless hair was usual in the severely affected children. The healthy, full-blood natives in this area have black hair, but in these children it was often light brown. The skin was likewise often pale. A scaling, crazy-pavement rash was occasionally present on the legs. Hair changes were seen in all 28 children, but only two had a rash.

Œdema was an occasional feature and usually easiest to see on the hands and feet. There were four children with it and all were severely ill. These children were all underweight for their age. In temperament, when first seen, they were listless, unhappy and irritable and were difficult with feeding. Correction of the anæmia alone did not alter this, for example transfusion did not change it. Prolonged dietary treatment did alter it. The child changed over, in about four to six weeks, to the normal, active, happy native child and developed a very good appetite. This change is always a sign that convalescence will be rapid from then on. These changes in temperament were seen in all the group.

CASE II.—A male child from a mission, aged 18 months and weighing 17 pounds 5 ounces, was admitted to hospital with anæmia, a "pot-belly", a large liver, discoloured hair and skin, and marked emaciation. He was very unhappy and lethargic; he was slightly œdematous; his hæmoglobin value was 4·5 grammes per 100 millilitres, his mean corpuscular hæmoglobin concentration was 25% and his marrow was normoblastic. His hæmoglobin level was raised to 9·1 grammes per 100 millilitres by transfusion, and with a high protein diet and added vitamins and iron he rapidly improved in general condition and disposition.

To illustrate the nutritional state of these children, the average weight of a group of eight Goulburn Island Mission children who had been followed for three years by the nursing staff of the mission are compared with the weights recommended as normal for Victorian children in the same age groups (Scantlebury-Brown, 1951) (Figure II).

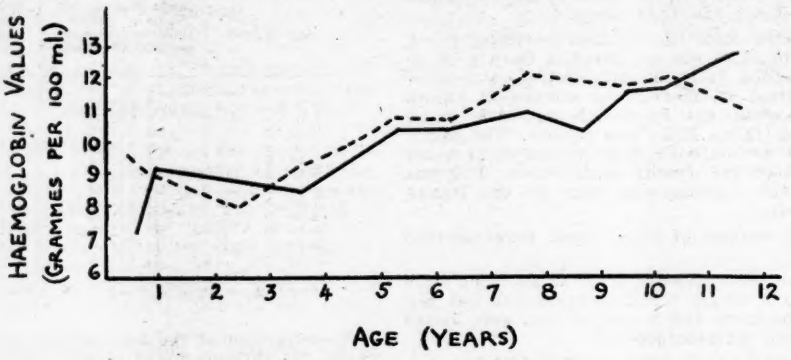

FIGURE I.
A comparison of the hæmoglobin values of 155 children with hookworm (broken line) and of 129 children without hookworm at various ages.

Diarrhœa was prominent in only a few cases, and when it occurred it was a sign of a prolonged illness. The stools were fatty and offensive. Culture for pathogenic organisms and examination for amœbæ yielded negative results, though hookworm, *Hymenolepis nana*, *Strongyloides stercoralis* and *Enterobius vermicularis* were common, as in all native children in this area. Two children showed this symptom severely, but others in lesser degree.

Of the 28 children, 25 had hookworm. The children were subject to recurrent gastro-intestinal infections, especially dysentery due to *Shigella sonnei* and *S. flexneri*, to respiratory tract infections and to otitis externa. Many of them had at least one secondary infection during the period of observation.

Although this clinical picture was not always complete, the severely affected children could be recognized by the clinical signs before their hæmoglobin values were estimated.

Some case histories will illustrate the severer types of illness seen.

Reports of Cases.

CASE I.—A female native child, aged 15 months, was admitted to hospital with a history of anæmia and recurrent diarrhœa for three months. She had been treated at the mission with intramuscular iron. When admitted to hospital the child was lethargic, but irritable if disturbed; she was œdematous and had a scaling, crazy-pavement rash on her legs; she had discoloured hair and skin; she was anorexic and dehydrated; her liver was enlarged; her hæmoglobin value was 4·4 grammes per 100 millilitres and she was heavily infested with hookworm and *Strongyloides stercoralis*.

She was given a high protein diet with added vitamins and iron. Her hæmoglobin level was raised to nine grammes per 100 millilitres by transfusion. Her bone marrow was not examined until after two weeks' treatment when it was found to be megaloblastic.

Her improvement continued with the high protein diet with added iron and vitamins till she was cured in eight weeks. Her weight rose during that time from 17 to 23 pounds.

Discussion.

These results indicate the presence of a condition characterized by anæmia, changes in temperament, skin and hair changes, large liver and pot belly and sometimes diarrhœa. This condition occurs chiefly in children between the ages of one and five years.

The ætiology is partly iron lack, but this explains only the anæmias that are hypochromic and microcytic with a normoblastic marrow. The rest of the pattern would fit in with a protein lack as it resembles the picture in kwashiorkor. Consideration of the diet of these children, especially in the second year of life, shows that both iron deficiency and kwashiorkor could be expected.

A white child who is fully breast fed by a mother who has been adequately nourished throughout pregnancy and lactation, can be expected to need iron supplements to prevent iron deficiency between the ages of six and nine months. These native children are frequently given no appreciable iron in the first two years while being breast fed by a mother who is often anæmic and poorly nourished in pregnancy, hence iron deficiency develops. It is reasonable to expect that hookworm infestation will exaggerate the iron deficiency, but this could not be demonstrated in the present study; however, the intensity of hookworm infestation was not taken into consideration in the present work.

The development of evidence of protein deficiency in children who are practically wholly dependent on breast milk in the first two years of life has been seen in numerous tropical countries (Jelliffe, 1955). Breast milk is a good source of protein in the second year of life, but not an adequate diet on its own. This is especially true as the native mothers are frequently malnourished. This protein deficiency, together with the frequent infections to which their unhygienic living conditions expose the children, could be expected to precipitate kwashiorkor.

The graph of the weights of the Goulburn Island children shows a close relation to those of white children in the first six months of life and then a falling away, which suggests poor nutrition in the later breast feeding period. We do not know the ideal weights for native children, but the fact that their heights approximate to those of white children much more closely than their weights suggests poor nutrition.

A serious exaggeration of this state of malnutrition occurs if the mother becomes pregnant while she is still breast feeding a baby aged, say, 12 or 15 months. The reduced supply of breast milk for this child leads to

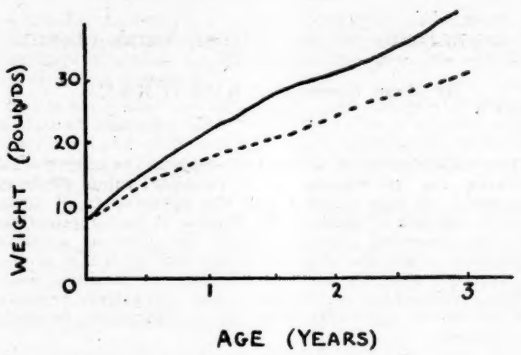

FIGURE II.

The weights of eight Goulburn Island children (broken line) compared with those recommended for Victorian children (continuous line) at various ages.

malnutrition and forced weaning at an age when it is impossible to obtain a suitable diet for the child. In the past this had led to the deaths of many native children.

Summary.

An investigation was conducted into anæmia and the nutrition of native children in the northern part of the Northern Territory.

Anæmia associated with a kwashiorkor-like nutritional disease is common between one and five years of age.

The children in this age group are frequently deficient in iron and protein as a result of the absence of a suitable supplementary diet in the late breast feeding period, and of a suitable weaning diet.

Hookworm is not a principal factor in the anæmia of these children, but its importance has not been fully investigated.

Acknowledgements.

I wish to thank the Director-General of Health for permission to publish this paper. I also wish to thank Dr. A. H. Humphry and Dr. R. C. Webb and the sisters on the various missions and settlements and in the native ward at the Darwin Hospital for their help and cooperation.

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AN ASPECT OF SALK VACCINATION IN ADULT WOMEN.

By W. J. STEVENSON,

Victorian State Health Department, Melbourne, and the Epidemiological Research Unit, Fairfield Hospital, Melbourne.

IN June, 1956, several members of a group of women to whom Salk vaccine had been administered complained of delayed onset of menstruation, which they attributed to the vaccine. Dr. Peter Colville and Dr. B. P. McCloskey, of the Victorian State Health Department, to whom the complaints were made, conferred with the Chief Health Officer, Dr. Kevin Brennan. As a result it was decided to inquire whether similar complaints had arisen among other women, mainly nurses, who had been given Salk vaccine.

A questionnaire was prepared for circulation. It was realized that if leading questions were asked concerning the possible ill effects of Salk vaccine, an excess of affirmative answers was to be expected. This difficulty could not be entirely overcome, but it was minimized as far as possible. At that time, when Salk immunization was just starting in Australia, it was imperative to find out whether or not there was any basis for the complaints. The first task was therefore to accumulate and critically examine all available information.

The response to the questionnaire was disappointing. Many recipients did not complete it, despite tactful pressure. It seemed that an inquiry into menstrual irregularities was regarded as a resented intrusion into privacy. It was not feasible to state the reason for the inquiry, because this would have defeated its object.

Replies were received from 130 out of a total of 350 subjects. This sample could not be regarded as unbiased, because of the likelihood that those who had any menstrual disturbance would be more likely to have completed the questionnaire. But since no other information was available an attempt was made to assess the significance of the data.

The first check on the sample was to ascertain whether the expected average length of the menstrual cycles was the normal 28 days. If so, equal numbers of subjects should have stated the interval between the dose of vaccine and the onset of menstruation as being within one, two, three or four weeks. As there were 130 subjects, between 32 and 33 should have received the dose of vaccine within one, two, three or four weeks of the onset of the next menstrual period. The numbers observed were 28, 33, 35 and 34. The close agreement with the expected finding gave some assurance that answers to other questions might be reliable.

Among other questions, the subjects were asked whether there was an increase of menstrual pain in the period following injection, and whether the period was delayed. It seemed probable, if the inoculation of poliomyelitis vaccine did have any influence on the next period, that the time within the cycle when the dose was given might have a decisive effect on the result. To put this conception in its simplest terms, it seemed improbable that any inoculation given just as one menstrual cycle had ceased would affect the next period one month ahead, whereas if the vaccine had been given just before a period was due, it might affect that period.

Of the 130 subjects who replied to the questionnaire, 25 complained of excessive pain in the next menstrual period after the dose of vaccine, and, of these, eight (32%) had received the injection more than 21 days after the cessation of the previous period. Of the 18 subjects who stated that the period after the administration of the vaccine was unduly delayed, 12 (66%) had received the vaccine more than 21 days after the previous period (Table I). The difference in these two groups, though just falling short of statistical significance, did suggest that a dose of vaccine given a few days before the expected onset of a menstrual period might delay the time of onset of menses.

Further investigation using proper controls was obviously indicated. We were aware of a fallacy in the above-mentioned comparison. The later the dose of vaccine was given in the cycle, the more likely it was to be associated with the delayed onset of menses, because the relative chances of its being associated with an early onset must diminish.

TABLE I.
Relation of the Time of Vaccine Injection to the Type of Menstrual Irregularity.

Complaint.	Vaccine Given.		Total Number of Subjects.
	Within 21 Days of Previous Period.	More than 21 Days after Previous Period.	
Excessive pain ..	17	8	25
Undue delay ..	6	12	18

For the next investigation, a group of female volunteers, aged between 18 and 40 years, were selected on the basis of their integrity and cooperation. A series of questionnaires were formulated, requesting information on the date of the onset of the previous menstrual period and the expected date of the next period. Provision was made for mention of such abnormalities as dysmenorrhœa and menorrhagia. A separate questionnaire was obtained from each volunteer prior to each injection. Every effort was made to maintain the confidential nature of the inquiry; the names of those participating did not appear on the forms. Excellent cooperation was received from the participants, and there was no reason to doubt that the information supplied was as accurate as could be expected in such a study.

The standard Salk poliomyelitis vaccine (formol killed) was supplied by the Commonwealth Serum Laboratories. An innocuous salt solution coloured with phenol red to simulate Salk vaccine was used as a control. All recipients received three subcutaneous inoculations of 0·5 millilitre each, at intervals of 28 days. Half of the group were inoculated initially with the control solution, followed at twenty-eight-day intervals by two vaccine injections. The remainder received two vaccine inoculations, followed by the control solution.

An analysis of the material on 190 persons is contained in Table II. As our main interest was the possible effect

TABLE II.
Relation of the Onset of Menstruation to Salk Vaccine and to Control Inoculations in 190 Subjects.

	Onset of Menstruation.		
	Early.	On Time.	Late.
After Salk vaccine ..	74	39	77
After control solution ..	75	38	77

of the administration of vaccine on the onset of menstruation, details of such conditions as dysmenorrhœa and menorrhagia were omitted. There was no significant increase in the incidence of these conditions in those who received vaccine compared with those who received the control solution. It is apparent that variations in the expected times of onset after injection with the vaccine form a pattern almost identical with that observed after injection with the control solution.

Conclusion.

The administration of Salk type poliomyelitis vaccine in the usual doses does not induce delayed menstruation. The necessity for adequate controls in an investigation of this nature is clearly shown. From the initial studies, an association between the use of the vaccine and menstrual irregularities seemed a distinct possibility. A full-scale trial was necessary to dispel any doubts which might have arisen concerning the use of vaccine in adult women.

Acknowledgements.

I am indebted to the Chief Health Officer, Dr. Kevin Brennan, for permission to publish this paper; to Mr. Cyril Jacka for statistical assistance; to Dr. E. V. Keogh and Dr. A. A. Ferris for their cooperation and valuable advice. Grateful thanks are expressed to the volunteers whose cooperation made this study possible.

EXPERIENCE IN A VARICOSE VEINS CLINIC.

By MARK SHEPPARD, F.R.C.S., F.R.A.C.S.,
Adelaide.

THE following is an account of impressions gained while working for 10 months in a varicose veins clinic in England.[1] In this clinic I had the opportunity of seeing a large number of cases of the varix and its complications, and of observing the results of the modern stripping operation. I had the pleasure of working with that pioneer of varicose surgery in England, Mr. R. Rowden Foote, whose tremendous enthusiasm and experience changed my attitude to the varix from one of frustration to one of fascination.

I have become convinced that the best results can be obtained only by segregating these patients in a special clinic with nursing and physiotherapy staff skilled in this particular work. It should be run by an enthusiastic and experienced surgeon who is willing to spend the time necessary for the attention to detail required to obtain the best results.

One must never lose sight of the fact that it is the patient, and not the varix, that is being treated. Every patient presents a separate problem. This, in itself, makes the work interesting.

Physio-Pathology of the Varix.

The key to the diagnosis and treatment of the varix lies in the proper understanding of the normal mechanism of the venous return from the legs and of its derangement. The normal leg acts as a muscle pump, driving the blood up the valved deep veins. Blood in superficial veins is sucked into the deep veins, through valved communicating veins (communicators). These communicators may be indirect, via small intramuscular veins, or direct, through the deep fascia. The saphenous veins are, in fact, special examples of direct communicators.

Leakage of blood under high pressure from deep to superficial veins through incompetent direct communicators (including the saphenous veins) results in a dilated, tortuous, subcutaneous venous plexus, especially marked in the lower third of the leg. This results in eczema, œdema, pigmentation, fibrosis, fat necrosis and chronic cellulitis, all of which should be regarded as pre-ulcerous. Finally, and often associated with minor trauma, ulceration occurs.

The importance of incompetent communicators in the lower third of the leg as a cause of ulceration was stressed by Linton (1938). Foote (1952) recognized their importance and advocated their ligation when found at operation. Cockett and Elgan Jones (1953) showed the common sites of these "ankle perforators", described the "ankle flare" commonly associated with their incompetence and coined the phrase "ankle blow-out syndrome". The "ankle flare" consists of a plexus of dilated venules containing blood under high pressure above, behind and below the medial (or more rarely, the lateral) malleolus, and fading away into the heel pad. It may be disguised by resulting œdema and fibrosis. It should be regarded as a

[1] Harrow Hospital, one of the Charing Cross group of hospitals.

pre-ulcerous state demanding urgent treatment (Cockett, 1956).

The Clinic.

A nurse skilled in the application of the various compressive bandages is essential. A small platform is useful for examination, but no special equipment is necessary. There should be close cooperation with the physiotherapy department.

A detailed history is taken of the varicose condition, and inquiry is made into the general state of health of the patient. A past history of deep vein thrombosis or "white leg", a family history of varices and the presence of "exercise" or "rest" pain in the calf or foot are important, as are the age and occupation.

Whenever necessary, a complete general examination is made, the possibility of abdominal or pelvic pathology being kept in mind. In all patients the probable expectation of life is assessed.

The lower limbs are exposed to well above the groins, the patient standing on a small platform in a good light. Observation and palpation give most information, it being remembered that varices can be felt before they are seen, especially in fat people.

The internal saphenous vein is examined with special reference to the sapheno-femoral junction and to the other common sites of incompetent communicators along its course. These commonly occur in the lower third of the thigh and just below the knee. The presence of a cough impulse in the upper third of the vein denotes an incompetent sapheno-femoral valve.

The external saphenous vein, so frequently forgotten, is best examined with the knees slightly bent. Usually it enters the popliteal vein behind the knee, but it may do so lower down or higher up, or proceed upwards to join the internal saphenous vein in the thigh.

Search is then made for incompetent ankle communicators ("ankle blow-outs"). These commonly are situated a half to one inch behind the medial border of the tibia, six inches and four inches above the medial malleolus. A postero-lateral "blow-out" may occur about six inches above the lateral malleolus (Cockett and Elgan-Jones, 1953). Their presence may be revealed by a palpable tender gap in the deep fascia, or by a localized venous dilatation. They may be suspected by the presence of a well-marked ankle flare, but they are frequently masked by resulting œdema, eczema or ulceration.

The peripheral arterial circulatory state is assessed by noting the colour and temperature of the feet and toes, and by palpation of peripheral pulses. Oscillometry may be useful in determining the level of arterial block, followed if necessary by arteriography.

The œdematous, dusky limb of previous deep vein thrombosis (the post-thrombotic limb) is characteristic. Associated ulceration is usually large and deep, with penetration of the deep fascia, surrounding fibrosis and chronic cellulitis. However, the presence of a patent deep system can be assured by the absence of calf pain on 10 minutes' exercise with a firm elastic bandage applied from the toes to the knee. The Ochsner-Mahorner and Trendelenburg tests give little additional information and are seldom required.

The multiple tourniquet tests are useful in the more severe cases in determining the sites of incompetent communicators, especially those associated with the ankle blow-out syndrome, but in the presence of advanced varicosities they may be somewhat impracticable.

Venography and intravenous pressure tests are rarely used, it being considered that though their place in the elucidation of the pathology of the condition has been invaluable, they give no information of great practical value in the majority of cases. However, in deep vein thrombosis of long standing (the post-thrombotic limb), a venogram may be helpful in determining the patency of, and condition of the valves in, the deep veins. It may also aid in detecting and localizing incompetent communicators, especially the ankle blow-outs (Dodd and Cockett, 1956).

Treatment.

It must always be remembered that varicose veins are progressive, especially in those with a strong family history. The patient must be warned that any operative procedure represents only a phase of treatment, and that review at regular intervals is essential.

In selecting cases for operation, the general factors discussed are taken into account. In general, all relatively young, active, useful people with symptomatic varices of the saphenous systems, or those with high pressure, incompetent communicators, are submitted to operation. Older patients should have a reasonable expectation of active useful life. Priority in a busy clinic is given to patients whose work requires prolonged standing, e.g. young mothers, nurses, shop assistants. The pre-ulcerous state demands urgent priority.

The patient must be perfectly fit for general anæsthesia, as there must be no mortality or serious morbidity in an operation for a condition which is, after all, non-lethal, and in which there is the good alternative of compression therapy.

Obesity predisposes to ulceration and post-operative deep vein thrombosis. Pre-operative slimming to the optimum for weight and age is very important. All patients are treated by compression in elastic stockings or bandages, pending operation.

Patients with severe œdema and subcutaneous fibrosis associated with deep vein thrombosis are usually best treated by compression therapy and massage alone. However, if the deep veins have been shown to be patent, and if it is believed that the retrograde circulation in the superficial varices is "causing an additional embarrassment to an already damaged deep circulation" (Foote, 1951, 1957), the patient is submitted to operation after a prolonged course of massage and bandaging have eliminated the œdema and improved the local skin circulation. These patients are warned that physiotherapy and compression may be necessary for a prolonged period post-operatively (Myers and Cooley, 1954).

Patients with varices and associated ulceration are treated initially by compression therapy, it having been shown that most cases can be so healed (Foote, 1954). Split-skin grafting is a most useful procedure in hastening healing. This is followed by two to three months of firm elastic bandaging, together with massage, after which the veins may be stripped through relatively healthy tissues.

In this clinic primary ulcer excision and associated ligation of "high-pressure leaks" through a long incision (Linton, 1938, the "subfascial" operation; Cockett and Elgan Jones, 1953, the "extrafascial" operation) was resorted to only in the very chronic or recurrent ulcer in which removal of the fibrotic base and surrounding skin was necessary for permanent healing.

Operation.

The principles of operation are as follows.

1. Flush ligation of the diseased saphenous vein (or veins) above the entrance of all tributaries, together with ligation of these tributaries.

2. Complete removal of the affected vein by stripping, and its larger branches by stripping or excision.

3. Eradication of additional incompetent communicators through separate incisions.

The steps in the operation have been described by Foote in his book (1954) and beautifully illustrated in his film.[1] Several points, however, will be stressed. (*a*) The involved veins and the accurately located blow-outs are marked with indelible ink, the patient standing. (*b*) One leg only is stripped at the one operation, though additional ligation of blow-outs and excision of "cosmetic" veins may be done on the other leg also. This allows early ambulation and exercises to prevent deep vein thrombosis. An exception may be made in young healthy people with bilateral

[1] "Surgery of Varicose Veins", 16-millimetre film prepared under the direction of Mr. R. Rowden Foote by Messrs. Smith and Nephew. This is available for showing in Australia, through the courtesy of Smith and Nephew (Australia) Pty. Ltd.

uncomplicated internal saphenous varicosity. (*c*) General anæsthesia is used. Despite perfect local anæsthesia, the stripping procedure is unpleasant for the conscious patient. (*d*) The whole limb is painted with flavine in spirit in the ratio one to 1000. A sterile glove is applied to the forefoot, thus excluding interdigital infection or tinea from the operation site. (*e*) The stripper used is the Myers intraluminal type. The large half-inch head may be increased in size by threading a washer down the stripper. A large head tends to prevent inversion and rupture of the vein. (*f*) When stripping the internal saphenous vein, the groin dissection is done first, special care being taken to ligate all tributaries. Failure to ligate the medial accessory saphenous vein where it commonly joins the main vein two or three inches below the sapheno-femoral junction results in its rupture on stripping and in a possible hæmatoma in the groin wound. Although termed "flush ligation", the vein is ligated with thread, half an inch from its termination. This, together with gentleness in handling the vein, is very important in the prevention of deep vein thrombosis. The stripper is passed up the vein through a small vertical incision in front of the medial malleolus. Difficulty in passing the stripper is largely overcome by experience, but previous ligatures, phlebitis or injections may necessitate exposure of the stripper at the point of obstruction and stripping in segments. The vein is stripped by a slow, steady pull, the assistant keeping the skin on the stretch just below the advancing stripper head. The tributaries are thus slowly stretched before they break, and tend to retract with the minimum of bleeding. (*g*) The external saphenous vein is stripped only if it is dilated with an incompetent sapheno-popliteal valve. The stripper is passed from below through a small vertical incision behind the lateral malleolus. The upper end of the vein is then exposed through a transverse incision. It is ligated half an inch from its junction with the deep vein. Care must be taken that the stripper does not pass into the deep vein. (*h*) Post-operatively, there is a routine of bed exercises and early ambulation. Constant attention is given to the efficiency of the crepe bandaging. The patient leaves hospital within two to four days, and returns for removal of sutures in about 10 days.

Physiotherapy and Compressive Therapy.

In the initial treatment of ulceration, ambulatory compression treatment with dry or sticky bandages is used. Once healing is well under way, vigorous massage combined with dry elastic bandaging hastens healing and gives a softer, slimmer leg than with compression alone (Foote, 1957). All patients with œdema and fibrosis associated with deep vein thrombosis have prolonged massage together with elastic support. "Bicycle" exercises, self-massage and Buerger's exercises become a daily routine.

The elastic bandage is applied from toes to knee, firmly around the foot and the lower third of the leg, and progressively more loosely towards the knee. It is removed and reapplied several times a day. The Rowden Foote "one-way stretch" and "two-way stretch" bandages are especially useful for this purpose.

Cockett and Dodd (1956) deprecate the use of "Elastoplast" on account of skin sensitivity. However, its application over two layers of "Tubegauz" (Scholls) obviates this risk and proves most satisfactory, prolonging the life of the bandage. Similarly the application of "Viscopaste" and "Tubegauz" in alternate layers is useful. "Coltapaste" bandage under the "Elastoplast" is of particular value when the limb is eczematous.

Injection Therapy.

Small "cosmetic" veins in patients with competent saphenous systems may be treated by injections. It is most important that the main saphenous veins should never be injected, as it may prejudice a possible stripping procedure in the future.

Post-operatively any remaining "cosmetic" veins, or small branches of the saphenous veins which have not become obliterated, are injected.

Results.

As all patients operated upon over the past 15 years had been asked to report yearly for review, I had the chance to observe (*a*) the early results of my own cases over a period of 10 months; (*b*) the results of the stripping operation done over the previous five years; (*c*) the results of the various other operative procedures done over the previous 10 years.

The early results in the uncomplicated cases were uniformly good in relieving symptoms and signs. However, sometimes small cosmetic veins remained, and these were treated by injection or by excision. It was noted that one's own results improved remarkably with experience, and with the care that was taken in searching for and obliterating high pressure blow-outs.

The majority of patients who had undergone the modern operation for uncomplicated varices over the previous five years were free of symptoms and did not require support. The best results were in persons in the younger age group, most of whom had perfect legs. In cases complicated by œdema, fibrosis or ulceration, associated with varying degrees of deep vein thrombosis, one's impression was that the operation had improved them considerably, but that a high proportion still needed some form of elastic support.

Of patients who had undergone some other form of operative procedure (usually high saphenous ligation, together with multiple ligations or retrograde injection of sclerosants), the great majority had developed saphenous recurrences and needed some form of elastic support. These patients had either undergone operation in this clinic in the preceding ten-year period, or been referred from other centres.

I became satisfied that high ligation together with the stripping procedure is a great advance on all other types of operation. It is not the final answer, but the best that we have to offer the patient at present.

Summary.

1. The best results in varicose vein surgery are obtained in a specialized clinic with specially trained surgical, nursing and physiotherapy staff.

2. An understanding of the physio-pathology of the venous return is essential.

3. The method of selection of patients for operation on the basis of age, occupation and risk of ulceration is described.

4. The observed results of the stripping operation in patients operated upon over the last five years are infinitely better than those of other procedures done over the previous 10 years.

5. Several points in the operative technique are described.

6. The value of elastic compression, massage and exercises in the treatment of varicose ulceration and deep vein thrombosis is stressed.

Acknowledgements.

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Reviews.

Deafness, Mutism and Mental Deficiency in Children. By Louis Minski; 1957. London: William Heinemann (Medical Books), Limited. 7¼" × 4¾", pp. 90, with 13 illustrations. Price: 12s. 6d. (English).

THE subject of this book is of great significance with an appeal to many sections of the community. It is a short book of 80 pages, and a large proportion of these are taken up with details of psychological testing with emphasis on the difficulties attaching to the testing of the child who is deaf and mute. The discussion of general aspects of the problem is somewhat elementary, but the emphasis on the need for prolonged occupation and repeated tests before a decision is arrived at is well called for. Unfortunately the summary on the book wrapper is a bad introduction to a proper perspective of this problem, with its statement that "This very important book stresses the difference between the children who are really mental defectives and for whom nothing can be done, and children who are only deaf or who have no speech yet are not deaf". It certainly does not seem right and proper to make such a distinction, and it is, of course, quite false to say that nothing can be done for those who are "really mentally defective".

The book has been published as a result of experience gained from a research grant over a period of three and a half years with a residential institution at Sutton, as well as a unit at Belmont Hospital for those requiring only a limited stay of up to eight weeks, and one of the recommendations in the summary is for the setting up of further units of similar nature in various parts of the country. How far it is advisable to take the young child from its home and place it in an institution for a prolonged period is, of course, still subject to much dispute. It is undoubtedly inadvisable in some cases, though the dangers attaching to institutional care have admittedly been over-emphasized in recent years following on the work of Bowlby. This aspect has been given some notice in the book under review, but not in great detail.

On the whole, the book may be described as a well-balanced approach to a problem of considerable difficulty, which does, however, require a work of greater magnitude to deal adequately with its many aspects.

Operative Obstetrics. By R. Gordon Douglas and William B. Stromme, with a foreword by Nicholson J. Eastman; 1957. New York: Appleton-Century-Crofts, Incorporated. 10" × 6¾", pp. 752, with many illustrations. Price not stated.

IN a foreword to "Operative Obstetrics" by Professor R. Gordon Douglas, of Cornell University Medical College, and Dr. William B. Stromme, a former colleague on the same service at the New York Hospital, Professor N. J. Eastman called the book "a great credit to the authors and to American obstetrics". Undoubtedly this is a comprehensive work, which treats not only of obstetric operations and their medical and surgical complications, but as well of every surgical condition that may beset the pregnant woman.

The book begins with a complete survey of the anatomy of the female pelvis. Then follow chapters on pre-operative care and operative management, anæsthesia and analgesia, infant resuscitation and care of the newborn—subjects all covered in great detail. The chapters on abortion, ectopic pregnancy, forceps, and Cæsarean section are extensively illustrated, and no detail is too insignificant to warrant mention. The chapter on forceps alone has 201 figures, many comprising both diagram and photograph. A large chapter deals with other operations on the genital tract, and includes an excellent review of the management of carcinoma of the cervix. The consideration of surgery exclusive of the generative tract ranges from abdominal conditions, such as appendicitis, for which the technique of operation is fully described, to pulmonary, cardiac and cerebral conditions, where the discussion centres around diagnosis and management. In similar detail are the final chapters on post-operative care and complications. There is a comprehensive bibliography at the end of each chapter.

A large number of people have spent a lot of time in the preparation of this book. It could possibly be criticized as a little wearisome in detail, especially where it deals with conditions usually handled by ancillary services (such as fluid and electrolyte balance), over-illustrated, and sometimes unnecessarily repetitive. The authors intend the volume for medical students, resident medical officers in training, general practitioners and specialists. Of these, resident medical officers and specialists are most likely to appreciate its worth. Students find much of the material in other text-books, such as those on anatomy, anæsthesia, medicine, general surgery and gynæcology. For specialists, however, much of it can be looked upon as a valuable refresher course in modern anæsthesia, operative technique and post-operative management. There is a wealth of information in discussions on indications and contraindications, and in the many excellent tables of incidences and results derived from the statistical examination of nearly twenty-five years of obstetrical experience at the New York Lying-In Hospital. The opinions expressed, with a bias towards conservatism in obstetric practice, must be regarded as sound and authoritative. As Professor Eastman says, "a new and major work on obstetrics has come to hand".

Applied Physiology of the Eye. By H. Willoughby Lyle, M.D., F.R.C.S., assisted by T. Keith Lyle, C.B.E., M.A., M.D., M.Chir, M.R.C.P., F.R.C.S.; 1958. London: Baillière, Tindall and Cox. 8½" × 5½", pp. 352, with 32 diagrams. Price: 45s. (English).

IN the preface to this book the author tells us that he has been associated with the study, practice and teaching of ophthalmology for a period extending over 40 years, and that he has written this book in an endeavour to help those who are working for higher degrees in ophthalmology. The book could well have been based on lecture notes used over a great number of years—it is very clearly set out with the main facts frequently tabulated. But it is very far from being a book about the physiology of the eye. A better indication of its contents would have been given had the book been titled: "Applied anatomy of the eye and visual system with an introduction to the diseases associated with the eye." Nearly half the book is concerned with applied neuro-anatomy, and practically the only illustrations are diagrams of nervous pathways and centres. The author seems almost unaware of the many aspects of the physiology of the eye that have been under very active investigation in recent years. Topics such as the transparency and sensibility of the cornea, the secretion of aqueous humour, aqueal dynamics and intraocular tension, the metabolism of the lens, the visual pigments and the electrophysiology of the retina and central pathways receive scant or no mention. The chapter entitled "The Neurophysiology of Vision" is almost completely devoted to remarks about the cerebral cortex. The physiology of the retina is handled in little over a page and a half, with most of the first page taken up with a list of the ten layers of the retina. Neither colour vision nor the dual photopic and scotopic function of the retina are mentioned, and the terms themselves do not find a place in the index. There is no treatment of the eye as an optical instrument. The descriptions of disordered function, or more often disordered structure, may have some usefulness as an introduction to ophthalmic medicine. Again, however, the treatment is very sketchy and at rather an elementary level, better suited to undergraduates than to post-graduates. The author apparently does not think that his reader will be much acquainted with general medicine. This is the kind of book that some candidates for higher examinations in ophthalmology may find useful at the beginning of their specialized study, but they should be aware of its rather considerable deficiencies.

Dynamics of Psychotherapy: The Psychology of Personality Change. By Percival M. Symonds, Ph.D.; Volume 3; 1958. New York and London: Grune and Stratton. 9" × 6", pp. 642. Price: $6.50.

IN this third volume of "Dynamics of Psychotherapy", Professor Symonds, of the Department of Education, Columbia University, deals with procedures. The verbal responses to the patient in the form of interpretation constitute the "principal therapeutic tool", assisted by reassurance, suggestion, commands, persuasion and advice, these latter procedures being all that is desirable and even safe in certain cases, and indeed all that is practicable for the majority. Ideally the therapist should preserve a passive role unless he has to deal with intense anxiety and obdurate

resistances. But since the aim of psychotherapy is to have the patient accept and assimilate the interpretations, it is difficult to avoid the conclusion that suggestion rather than interpretation is the essential dynamic factor. Professor Symonds subdivides interpretation into intervention, clarification and confrontation. Intervention includes encouragement, suggestion, appeals to pride and ambition, and perhaps also the sharing of experiences—anything from a cigarette to a camping trip. Clarification consists in helping the patient to redirect his thinking and feeling. A grunt or the American "uh-uh" will indicate that the patient's remarks have been noted and accepted. Confrontation is described as being identical with the interpretative procedures employed by psychoanalysts.

In the psychotherapy of children, reassurance is called for when the child feels rejected from his family circle. Interpretative techniques are best applied through the observation of play, e.g., the child's attitude to a doll. The child must be helped in giving verbal expression to his feelings. The author favours a far more cautious approach than that employed by Melanie Klein, since reference to basic impulses, often unavoidable in psychotic, severely disturbed types, may make it more difficult for the child to conform to social requirements.

Since clinical examples are taken from a wide range of literature, one wonders to what extent Professor Symonds has drawn on his own clinical experience. The trilogy impresses as being a laudable though not entirely convincing attempt to present the various techniques in a more systematized form than is justified in the present state of our knowledge.

Management of the Handicapped Child: Diagnosis, Treatment and Rehabilitation. Edited by H. Michal-Smith, Ph.D.; foreword by Arnold Gesell, M.D.; 1957. New York: Grune and Stratton. 8" x 5¼", pp. 286. Price: $6.50.

THIS book consists of some 13 essays by a number of authors on various types of the handicapped child, who, for the purpose of this book, is defined as "any child with a chronic illness which may be incapacitating from a physical, psychological, social, education or vocational point of view". Thus the authors are concerned with handicaps which threaten to be permanent or of such long duration as to interfere with the emotional, social and intellectual (through education) development of the child. In a text devoted to this subject one would expect to find chapters on the child with hearing, visual or speech defects, the child with a cleft lip and palate, the child with neuro-muscular disease, and the child with cardiac disease, nephrosis or defective growth, but it may come as a surprise to some readers to find a chapter devoted to the gifted child.

The dominant theme of the book is that the handicapped child should be enabled to live a normal life restricted only by the limits imposed by his handicap, and that the community resources should be so organized that the effects of the particular handicap are minimal. It is therefore fitting that the final chapter is concerned with "Community Aspects and Care for the Handicapped Child". Three chapters are concerned with emotionally disturbed children. One chapter is devoted to the child who is forced to spend a large part of his life in an institution.

Comparatively little space is devoted to the technical management of the specific defect, the emphasis being directed to the over-all management of the whole child and the education of his parents to accept the handicap and help the child adjust. The feelings of the parents of a child with one of the various disabilities are considered in some detail. The emotional problems within the child are also discussed and suggestions made for the handling of these. This would be a most useful book on the desk (not on the shelf) of the pædiatrician and the general practitioner who is interested in children, their defects and their problems.

Recent Advances in Oto-laryngology. Third Edition, by F. Boyes Korkis, M.B., Ch.B., D.L.O., F.R.C.S., F.R.C.S. (Eng.), with a foreword by R. Scott Stevens, M.D., F.R.C.S.; 1958. London: J. and A. Churchill, Limited. 8½" x 5", pp. 446, with two coloured plates and 144 text figures. Price: 60s. (English).

THE "Recent Advances" series has always been a great help to the post-graduate student, in that it provides a summary of new work and a critical survey of recent literature, usually before they are incorporated in text-books. The reappearance of "Recent Advances in Oto-laryngology" after nine years is gratifying and will be welcomed. The greatest change has been in the surgery of the temporal bone, and this is well covered. Fenestration, stapes mobilization, Ménière's disease and the facial nerve are all summarized. The research and investigation of the labyrinth and vertigo are reported. Aural trauma, hearing aids and many other subjects are mentioned. The remaining sections deal mainly with the surgery of malignant disease. The book is a report on a very wide variety of subjects, as is to be expected after a nine-year lapse. The opinions of the author are helpful to the student. Perhaps the book would give more appeal to the established specialist if it was the work of a panel of writers, each writing with authority in his own section, giving a variety of style and opinions expressed. Nevertheless, it is a good summary with sound comments and is well worth reading.

Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"Ophthalmic Plastic Surgery", by Sidney A. Fox, M.S., M.D., F.A.C.S.; Second Edition; 1958. New York and London: Grune and Stratton. 10" x 6½", pp. 336, with 149 illustrations. Price: $15.00.

This book has been revised and expanded since the first edition was published in 1952.

"Lumbar Disc Lesions: Pathogenesis and Treatment of Low Back Pain and Sciatica", by J. R. Armstrong, M.D., M.Ch., F.R.C.S.; Second Edition; 1958. Edinburgh and London: E. and S. Livingstone, Limited. 9¾" x 6¼", pp. 256, with 60 illustrations. Price: 45s. (English).

A revised version of the book, which appeared in its first edition six years ago.

"Progress in Psychotherapy: Volume III. Techniques of Psychotherapy", edited by Jules H. Marrerman, M.D., and J. L Moreno, M.D.; 1958. New York, London: Grune and Stratton, Inc. 9" x 5¾", pp. 336. Price: $8.50.

The third of a series of annual volumes.

"Dukes' Bacteria in Relation to Nursing", revised by Stanley Marshall, M.D., B.S., M.R.C.S.; Third Edition; 1958. London: H. K. Lewis and Company, Limited. 8½" x 5½", pp. 224, with 18 illustrations. Price: £1 1s. (English).

Intended as an introduction to bacteriology "for Sister Tutors and the more junior nursing staff".

"Medicine and Man: The Story of the Art and Science of Healing", by Ritchie Calder, C.B.E.; 1958. London: George Allen and Unwin, Limited. 8½" x 5½", pp. 256. Price: 16s. (English).

A popular history of medicine.

"Anxiety in Christian Experience", by Wayne E. Oates; 1958. London: George Allen and Unwin, Limited. 8½" x 5½", pp. 160. Price: 15s. (English).

A book for the pastoral counsellor. The author draws his material from the Bible, contemporary psychotherapy and clinical pastoral experience.

"The Introvert: A Psychiatric Study of Social Adjustment for Student and Layman", by Ainslie Meares, M.B., B.S., B.Agr.Sc., D.P.M.; 1958. Springfield, Illinois, U.S.A.: Charles C. Thomas, Publishers. 9" x 5¾", pp. 160. Price: 34s.

A book "addressed to all those people who come in contact with the introvert, in the hope that it will give them understanding to help him in his difficulties".

"Food for the People of Australia", by R. C. Hutchinson, B.Sc., D.Sc.; 1958. Sydney, London, Melbourne, Wellington: Angus and Robertson. 8½" x 5¼", pp. 262, with illustrations. Price: 32s. 6d.

A book on the food consumption and feeding pattern of the Australian people.

"The Practice of Infectious Disease", by Louis Weinstein, Ph.D., M.D.; 1958. New York: Landsberger Medical Books, Inc. 8½" x 5", pp. 512. Price not stated.

This book is written for the practising medical man and deals with only the infectious diseases observed most frequently in the United States and Europe.

The Medical Journal of Australia

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REHABILITATION AND THE COMMUNITY.

REHABILITATION is a modern phenomenon shared by medicine and the social services. Basically it is, of course, not a new conception, but little serious attention was paid to it in the past. Only since the second World War has it developed and so gripped the interest and imagination that it has been called "the third phase of medicine". It is very important that it should be regarded as part of medicine rather than as just part of the social services. It should begin at the moment the patient comes under treatment and not wait until convalescence, when the patient may find it difficult to respond or may even have reached a "point of no return". It should have medical supervision throughout and not pass entirely into the hands of members of ancillary medical and social services, capable, enthusiastic and sincere though they may be. As a corollary to this, it is better centred at the hospital, especially the larger well-equipped hospital, than at the isolated and specialized rehabilitation centre. This, it must be emphasized, is no medical "dog in the manger" view, aimed at keeping out others with their own special contributions to the process of rehabilitation. It is based on the doctor's particular responsibility of caring for the patient at all stages of his illness. The contribution of others is of the utmost importance. Indeed, so wide is the scope of those who have a part to play in rehabilitation that it is a challenge to the whole community, and W. Scott Allan has found this concept so important that he has written a book about it.[1]

In this book the author has achieved his purpose of presenting not a "how-to-do-it" manual, but "a broad approach to the several aspects of rehabilitation, stressing key facts and general principles rather than particular plans or methods". He has effected a much needed synthesis of knowledge and experience concerning rehabilitation, and has done so with the needs of the general reader clearly in mind. At the same time his book should have a wide appeal to the increasing number of practitioners, ancillary workers and laymen interested in, or already engaged in, this field. Those who wish to know the origin and significance of the term "Physical Medicine and Rehabilitation", or to learn why "rehabilitation is a late-comer on the stage of man's social progress", and especially why rehabilitation, having come of age, is now a community challenge, will find the answers clearly stated. However, it seems fair to suggest that what may be true of the author's America is not true of Australia today—namely, that "a large segment of the medical profession has obviously regarded rehabilitation as having little significance or concern for the average doctor". If it is true of some, they will find enlightenment, especially on pages 63 to 66, in which the author enumerates the six components of the process of rehabilitation, reiterating, unknowingly perhaps, the concept of Sir Robert Jones:[1] expert medical supervision, staff teamwork, a functional approach, an individualized programme (i.e. for the patient), a flexible programme (i.e. for the rehabilitation unit), and coordination and follow-up. Laymen and any doubting ancillary staffs concerned with rehabilitation will see in the author's brief explanation of the need for and importance of "direct and detailed medical supervision", why it is that rehabilitation cannot be other than a branch of medical practice. It is a process of treatment based upon the needs of a particular disabled patient and necessarily carried on under "direct and detailed medical supervision". On the other hand, those relatively few Australian and British medical practitioners who are not yet sufficiently weaned from their own restricted practices in neurology, orthopædics, physical medicine and rheumatology can learn simply from this book essential facts concerning the necessary roles in rehabilitation of the social worker, the counselling psychologist, the clinical psychologist, the vocational counsellor and the placement person.

So much for the first half of Allan's book, which deals with the mechanics of rehabilitation. The remainder concerns itself with social laws, health insurance, economic aspects, community organization and, finally, rehabilitation and the world community. Allan writes with exemplary knowledge and experience of all these aspects, and, although he is concerned primarily with the United States, many of his comments are to the point; in a larger context, for example, writing of workers' compensation, he refers to the "understandable tendency" of the relevant legislation "to concentrate on financial benefits to the exclusion, or at best the neglect, of rehabilitation to self-sufficiency"; commenting on the incompatibility of rehabilitation and bureaucracy, he states that it is evident that representatives from certain other countries at international conferences "conceive of the rehabilitation of disabled persons as properly organized and developed almost wholly within the general administrative framework of the national government" (i.e. subserved by compulsion of the patient). The relationship of rehabilitation to the community is quite other than this, but is none the less close. Indeed, so closely is it interwoven with almost all aspects of community life—with treatment, research and teaching in medicine, with the ills of childhood and of old age, with those of the solid core of our working adolescents and adults, with education, with training in skilled and semi-skilled work, with the influences of voluntary agencies, trade unions and governments, and with medical and other professions—that the title "Rehabilitation: A Community Challenge" could scarcely have been better chosen. Special comment is required perhaps on only two points—namely, surveying the need for rehabilitation and the coordination of rehabilitation. The former presents a most complex problem, the difficulties of which are perhaps

[1] "Rehabilitation: A Community Challenge", by W. Scott Allan; 1958. New York: John Wiley and Sons, Incorporated. London: Chapman and Hall, Limited. 9" × 5½", pp. 272, with illustrations. Price: $5.75.

[1] *Brit. M. J.*, 1925, 1: 909.

not sufficiently emphasized. Moreover, much is now being done in the field of rehabilitation which was preceded by only minimal survey, providing learning (of the size and ramifications of the problem) by doing (what proved to be possible with the best use of all available facilities); the resulting achievements and knowledge might not have been won had the communities concerned waited for some grand survey to be made. Certainly wisdom must prevail, and planning precede action, but practical limitations usually reduce a wished-for census to the dimensions of a representative sample. Coordination and integration are well discussed. The reader is reminded that it is for the patient that rehabilitation has arisen, and that he is a whole man, a unique combination of mind, body and spirit. The value of the active promotion of mutual understanding amongst the many groups of the community concerned in rehabilitation, and the special need for a central information centre for a community, are rightly stressed.

It is clear that in our democracy and in our medical and hospital practice there can be no place for a grand over-all scheme of rehabilitation and reemployment by any one agency. The challenge to the community is threefold: firstly, to invest in rehabilitation as a branch of medical practice, irrespective of whether a patient is potentially employable or not, with faith that the dividends warrant the investment; secondly, to encourage each member to give some practical support, whether as fellow employee, employer, union official, insurer, legislator, team member, practitioner, statesman, or fellow citizen; thirdly, and over all, to study and to pursue the wise development of the several related and unrelated particulars which constitute rehabilitation, and to do so with a sure faith that, in Albert Schweitzer's concept, on the practice of true humanity to our fellow men depends the future of mankind.

Current Comment.

THE EXTRA PHARMACOPŒIA (MARTINDALE).

THE first edition of Wm. Martindale's "Extra Pharmacopœia", a small volume of 300 pages, appeared in 1883 and found immediate favour as a complete epitome of current information pertaining to the composition, properties and uses of all substances—official, unofficial and proprietary—used in medicine and pharmacy. In the 75 years succeeding this, the unprecedented increase in therapeutic, pharmacological and pharmaceutical information, and in the number and variety of drugs and medicinal agents has multiplied immeasurably the difficulty, not only of maintaining the high standard and the enviable reputation of the original, but also in confining its great volume of condensed information within the compass of a book that can be readily handled. The latest edition,[1] however, loses nothing in this respect, but surely with some 1700 pages the limit of its capacity as a single volume must be at hand.

The book has been completely revised and brought up to date, not only by the inclusion of data relating to new drugs, but by amending reference to established drugs where experience has led to their revaluation. The first and major part is devoted to the general range of drugs in current use. This is followed by special sections dealing with the antibiotics, old and new; various immunological products—vaccines, antisera and diagnostic antigens; and the radioactive isotopes, their therapeutic uses, toxic effects and hazards. The drugs in the first part are set out on an alphabetical basis, considerably and advisedly modified by the inclusion together of drugs having similar therapeutic or pharmaceutical use under the title of a well-known member of the group. This conveniently brings together in their respective groups such drugs as the barbiturates, the sulphonamides, the antihistamines and the antimalarials, to mention but a few so grouped. The status of each drug in the British Pharmacopœia, the British Pharmaceutical Codex and the International Pharmacopœia is appropriately indicated, while reference is given to the place of each, where applicable, in a score of other national pharmacopœias.

As in previous editions, concise information is furnished in each monograph of pharmaceutical data, therapy, toxic effects, antidotes, uses and contraindications of the drug under consideration, and these observations are supported by abstracts from original papers. Where conclusions have been conflicting, unbiased selections of opposing views are presented. The difficulties involved in the multiplicity of pr prietary names for the same drug, and for proprietary formulæ containing such a drug, are at least lessened by including the names and formulæ of many of these as an addendum to each drug monograph. As a minor indication of the many newer drugs described, one might select at random nystatin, cycloserine and novobiocin among the antibiotics; the oral antidiabetics, carbutamide and tolbutamide; the hypotensives, chlorisondamine and mecamylamine; antitussives, dextromethorphan and pholcodine; cytotoxics, busulphan and demecoline; diuretics, acetazolamide and chlormerodrin; narcotic antagonists, nalorphine and bemegride; as well as numerous tranquillizers, antihistamines, relaxants and corticosteroids.

A supplementary list of drugs, containing in this edition some 400 items, has been reintroduced. While this serves as a reference to a large number of drugs which, like oak leaves, hang on a long time after they are dead, it also harbours some newer drugs which may yet establish themselves, but of which there is not, as yet, sufficient information available. A useful therapeutic index gives handy page reference to drugs and therapeutic measures available for use in each disease or syndrome listed, while a reliable and comprehensive general index containing some 20,000 entries gives an indication of the scope of this astounding volume.

If such information on therapeutic agents and their modes of application as may be required in the daily round is not in the current "Martindale", it will be difficult to find reference to it anywhere. Appreciative thanks are due to the Pharmaceutical Society of Great Britain for perpetuating in this the best features of the original "Martindale" and of "Squire's Companion", and in presenting us, within the confines of a single volume, a library from which accurate and adequate information may be obtained rapidly and predictably.

[1] "The Extra Pharmacopœia (Martindale): Incorporating Squire's Companion"; Volume I, published by direction of the Council of the Pharmaceutical Society of Great Britain; Twenty-Fourth Edition; 1958. London: The Pharmaceutical Press. 7¼" × 4¾", pp. 1728. Price: £3 5s.

BONE AND RADIOSTRONTIUM.

ARNE ENGSTRÖM, ROLF BJÖRNERSTEDT, CARL-JOHAN CLEMEDSON AND ARNE NELSON have recently published the results of a study of bone and radiostrontium over ten years in the Department of Medical Physics, Karolinska Institute, Stockholm.[1] In their book, while there is much that would be understood and of interest to the average reader, in general a high scientific standard is set. Early chapters describe the problem of the internal hazard from strontium deposition and highlight the limited information on humans on which present maximum permissible levels are based. A reference is made to the

[1] "Bone and Radiostrontium", by Arne Engström, Rolf Björnerstedt, Carl-Johan Clemedson and Arne Nelson; 1958. New York: John Wiley and Sons, Inc. Stockholm: Almqvist and Wiksell. 9" × 5¾", pp. 140, with many illustrations. Price not stated.

metabolism of strontium by mammals, the discrimination against strontium in each link of the food chain, the retention of strontium, and finally its elimination in urine and fæces. A chapter then describes the distribution of mineral salts in bone tissue, and detailed information is given on two methods, developed at the Institute, for studying the microscopic distribution and amount of mineral salts and organic matrix in calcified tissues. The techniques make use of an X-ray microscopic absorption image and microinterferometry. These techniques have been beautifully developed, and the resultant pictures of the bone specimens are full of interest, the prints being well reproduced. X-ray diffraction methods were used to study the bone salts and ultrastructure of bone tissue, and are followed by studies of the distribution of strontium 90 in the skeleton using gross and micro-autoradiography. The studies lead to the conclusions that bone structures possessing a relatively low degree of mineralization show a high uptake of bone-seeking isotopes. In the animal experiments, radiostrontium appeared in the bone tissue five minutes after injection, reaching a maximum in spongious bone after about six hours. After about sixty-four days, a considerable amount of the isotope was still in the skeleton, the quantity remaining relatively constant thereafter. It would appear that the amount of isotope incorporated per unit volume of bone tissue depends on the number of reactive sites per unit volume, spongious bone tissue showing the largest number of such sites. Bone of this type is found in the pelvic and jaw bones, the ribs and skull bones and the vertebræ. The growth zones in the long bones, for the same reasons, will also accumulate radioactive isotopes, as will the Haversian systems in these bones. As is to be expected, the rebuilding process is more intense in young growing individuals than in old ones; and from a health hazard point of view, it is important to note that the particular parts of bone receiving the largest doses of external radiation are in spongious bone tissue, where is also located blood-forming bone marrow. A chapter is devoted to calculations of the dose rate distribution from beta-ray-emitting isotopes, and these data are used, together with the concentrations of radioactive isotopes determined by the various techniques described, to calculate a maximum permissible dose for radioactive strontium 90. The maximum permissible figure arrived at is 0·1 microcurie, this figure being one-tenth of the present accepted international figure.

MONITORING AUDIOMETRY.

ONCE upon a time noise-induced hearing loss (to use a modern term) as an occupational disease was mainly confined to artillerymen, but today it occupies an important place among industrial diseases. In industries where noise is a serious hazard it is important to minimize its effects, and to do this effectively it would obviously be helpful to have some system of recording accurately any changes in hearing among personnel exposed to excessive noise. This question is discussed in a report recently submitted by a working group set up by the United States Government. The substance of this report is published in an article by H. Davis, G. Hoople and H. O. Parrack,[1] in which such a plan is put forward under the name "monitoring audiometry". The plan was developed for the United States armed forces, but is stated to be suitable for almost any industrial organization. Its objects are the identification and treatment of those persons with hearing loss who are amenable to treatment, the prevention of noise-induced hearing loss, and the proper care, protection and utilization of those who do incur hearing loss from any cause. The basic essentials of such a plan include: (i) the establishment of reference audiograms of all personnel who may be exposed to hazardous noise; (ii) the establishment of follow-up routine audiometry (monitoring audiometry); and (iii) the establishment of a set of limits of hearing variations beyond which subjects should be referred to a qualified otologist for diagnostic testing. Patients selected by this screening process will be handled according to the indications in each case. Those whose deafness may be due to noise may be further instructed in the use of protective devices, while others whose loss exceeds the established monitor limits may be referred to diagnostic otological centres for further investigation and disposal, which may mean the removal of susceptible individuals from further hazardous noise exposure when the risk of serious disability seems too great.

Safety regulations, while giving some protection to most persons from intense noise, cannot guarantee complete safety for everyone. The use of ear protectors calls for active cooperation of the individual wearer. Individuals, too, vary in their susceptibility to noise-induced hearing loss. Monitoring audiometry and proper medical disposal based on it are therefore essential accompaniments of safety criteria, safety regulations and protective devices. Monitoring audiometry is a periodic measurement of air conduction hearing and has the advantage that it will detect hearing loss in its early stages. The systematic use of the increase in hearing loss for high tones as an indicator of the danger of incurring a loss for the lower and more important speech frequencies is a relatively new concept. The monitor audiograms are compared with the earlier "reference audiogram" made prior to noise exposure. A "threshold shift" is the deviation in decibels from an individual's own previously established reference audiogram. A threshold shift may be temporary or persistent. Persistent shift is distinguished from temporary by the practical rule that any noise-induced threshold shift that lasts more than 40 hours after the last noise exposure is "persistent" for the purposes of monitoring audiometry, since there is seldom much improvement after that period. A persistent threshold shift may be a sign of injurious noise exposure and calls for protective action. It is now well established that the frequencies above the range necessary for the understanding of speech are particularly vulnerable to noise-induced hearing loss; and until they show significant loss, there is little risk of injury to hearing in the very important middle-frequency range. High-tone hearing is at least partly expendable, so that hearing losses in frequencies of 4000 cycles per second and above entail no significant social or occupational handicap. However, the loss of some of a man's vulnerable expendable high-tone hearing provides a valuable indicator of the beginning of noise-induced hearing loss. The particular vulnerability of hearing at 4000 cycles per second makes single-frequency screening practical. An empirical rule seems to be that hearing is very seldom worse for any frequency important for speech than it is at 4000 cycles per second. The rule enables monitoring audiometry to detect, by quick routine tests at 4000 cycles per second alone, the man who may have significant losses at other frequencies. Only for these subjects is it necessary to make complete monitoring audiograms. It is thus practicable to cull out by successive screening procedures those persons who are at a critical level of hearing. Individuals who show a raised threshold at 4000 cycles per second should be retested after 15 hours; and if the threshold has returned to that of the reference audiogram, the subject may return to duty. Should the threshold for the screening tone remain raised, then a further test should be made after 40 hours, and those who show such persisting losses should be referred for special diagnosis and recommendation as to future duties. The early appearance of a persistent elevation of hearing threshold for frequencies of 4000 cycles per second and higher may be taken as the warning of the likelihood of persistent threshold shifts at lower frequencies if noise exposure is continued. However, the appearance of temporary threshold shifts does not always indicate a likelihood of accumulation of residual permanent shifts. Accurate evaluation of hearing losses for the understanding of speech has not yet been exactly formulated in relation to pure-tone audiograms. It seems that in the essential speech range, 500 to 2000 cycles per second, a loss up to 17 decibels may occur without significant disability. Above that level the subject begins to be handicapped. Speech audiometry may then be necessary to estimate the degree of disability.

[1] *Arch. Indust. Health*, 1958, 17:1 (January).

Abstracts from Medical Literature.

PHYSIOLOGY.

Effect of Denervation on Growth.

H. SELYE AND E. BAJUSZ (*Am. J. Physiol.*, February, 1958) report that experiments on albino rats indicate that, after complete intrapelvic severance of the femoral, obturator and sciatic nerves, the growth in length of the inactivated tibia continues at a normal rate. The denervated bone also retains its sensitivity to the growth-promoting effect of somatotrophic hormone (STH) and to the growth-inhibitory effect of a variety of agents, such as dihydrotachysterol, cortisol and œstradiol. The characteristic pathological changes normally produced in bones by an excess of dihydrotachysterol or vitamin *A* are likewise not prevented by central denervation. On the other hand, the morbid lesions characteristic of bone lathyrism are greatly diminished after central denervation; presumably, these changes depend upon the functional activity of the legs. The experiments also indicate that the atrophy of a muscle (triceps suræ) that follows severance of its motor nerves can be further enhanced by certain compounds which produce intense catabolism (e.g., dihydrotachysterol, cortisol, œstradiol, thyroxin) and delayed by an anabolic hormone such as STH.

Effect of Polycythæmia on Respiration.

T. F. HORNBEIN AND A. ROOS (*J. Appl. Physiol.*, January, 1958) report that polycythæmia was achieved by transfusion of a young adult male. Studies were made before transfusion, during polycythæmia, and after return to a normal blood level. Minute volume of respiration and oxygen consumption were measured at varying work levels on a bicycle ergometer while breathing 14% oxygen, air, and 100% oxygen. An increase in hæmatocrit from 40% to 60% resulted in a consistent depression of ventilation during exercise. This was more pronounced during breathing of 14% oxygen than with room air; during breathing of pure oxygen little change in ventilation occurred. The classical concepts of carotid and aortic chemoreceptor activation are not adequate to explain this ventilatory effect of polycythæmia. Decrease in blood flow through these structures, and central pH as a factor modifying their effectiveness as a stimulant to respiration, might yet implicate them.

Maximum Breathing Capacity.

R. G. BARTLETT, JUNIOR, H. BRUBACH AND H. SPECHT (*J. Appl. Physiol.*, March, 1958) report that the maximum breathing capacity (MBC) predicted from the fast vital capacity (FVC) curve increases with increasing breathing rates. Experimentally determined data, however, indicate that the MBC increases with increasing breathing rates only to a point (determined by airway resistance level) after which it decreases. This deviation is most likely due to a minute volume deficit due to flow reversal in going from inspiration to expiration and vice versa. It has also been shown that one can reasonably predict the MBC from the FVC curves with high external airway resistances. A similar volume deficit due to flow reversal was also noted here, but the prediction error was less (if breathing rate of peak observed MBC was known) because of the smaller volume moved per breath, and also because of the smaller volume loss per breath multiplied by fewer breaths per minute. In addition, data have been collected showing the interrelations of airway resistance, breathing rate and maximum breathing capacity.

Effect of Thermal Injury on Glucose Utilization.

M. K. YOUNG, JUNIOR, *et alii* (*Am. J. Physiol.*, October, 1957) report that the effect of thermal injury on tissue metabolism was studied by comparing the glucose metabolism of normal rat diaphragm tissue incubated in plasma from injured and uninjured rats. Plasma was taken from the former 15 minutes after injury. Glucose concentrations in the plasma from the burned and control rats were made comparable to compensate for the hyperglycæmia due to injury. An inhibition of glucose uptake by the diaphragm tissue incubated in plasma from burned rats was demonstrated, whereas the Qo_2 and the conversion of glucose-U-C^{14} to $C^{14}O_2$ were not significantly changed. This inhibition of glucose uptake was observed when dialysed plasma from burned animals or the dialysate was used. Epinephrine under certain circumstances inhibited glucose uptake. These studies indicate that immediately after thermal injury a disturbance in glucose utilization occurs; this disturbance appears to be other than in the conversion of glucose to CO_2; a dialysable principle is present in the plasma; and epinephrine is not excluded as a causative agent.

Effect of Bacterial Endotoxins in Irradiated Animals.

W. W. SMITH *et alii* (*Am. J. Physiol.*, October, 1957) report that a single injection of endotoxin derived from Gram-negative bacteria caused an increased survival in lethally irradiated animals when given immediately after or 24 hours before irradiation. Mice responded better to the injection before irradiation and hamsters to the injection after irradiation. The effect was associated with a reduction in infection. This was pronounced in the case of streptococcal or proteus infection and was still significant in the case of pseudomonas infection. No beneficial effect was obtained when mice were given three endotoxin injections during one week or six injections during two weeks prior to irradiation. The beneficial effect is not necessarily associated with the granulocytosis which begins within a few hours after the endotoxin injection, or with the conditions under which non-irradiated animals show an increased resistance to bacterial challenge.

Effect of Pancreatic Secretin on Gastric Secretion.

H. B. GREENLEE *et alii* (*Am. J. Physiol.*, September, 1957) report that in dogs prepared with both a vagus-denervated Heidenhain pouch and a total pancreatic fistula, the intravenous injection of pancreatic secretin produced a profuse secretion of pancreatic juice and a simultaneous marked inhibition of gastric secretion. In dogs prepared with an isolated antrum pouch and a Heidenhain pouch the gastric secretion induced by the instillation of food in the antrum pouch was completely inhibited by the intravenous injection of pancreatic secretin. On the other hand, the intravenous injection of pancreatic secretin had little or no effect on the secretion of gastric juice produced by insulin hypoglycæmia or by the injection of histamine. It is suggested that pancreatic secretin may represent the mechanism by means of which acid food in the duodenum inhibits gastric secretion. It is probable that this inhibition is caused by prevention of gastrin release from the antrum rather than to a depressant effect on the parietal cells.

Blood Flow During Deep Hypothermia.

H. F. LYNCH AND E. F. ADOLPH (*J. Appl. Physiol.*, September, 1957) report that the minute blood vessels of rat mesocaecum and hamster cheek pouch were examined before and during whole-body hypothermia or during local cooling. Blood ceased to flow in about half the observed vessels at 20° C. (rat) or 10° C. to 5°C. (hamster). Arterioles, capillaries and venules did not change their mean calibres, hence vasoconstriction was not the rule. Linear velocity decreased in observed blood vessels. In hypothermia arterial blood pressure is known to remain high while pulse rate and cardiac output decrease greatly. Changes in blood viscosity account for nearly all the estimated increase of resistance, and narrowing of blood vessels in the tissues observed proves unimportant in upholding arterial pressure.

Effect of Antibiotics on Oxygen Consumption.

G. R. VOGEL, S. M. HAUGE AND F. N. ANDREWS (*Am. J. Physiol.*, January, 1958) report that the oxygen consumption of normal and hyperthyroid albino rats was measured before and after the intramuscular injection of 1·2 milligrammes (in 0·2 millilitre of solution) of procaine penicillin G, "Aureomycin" or "Ilotycin". The antibiotics caused a statistically significant decrease in the rate of oxygen consumption in both normal and hyperthyroid rats. This effect diminished with time. Similar effects were observed with procaine penicillin G after oral administration by stomach tube. It is suggested that antibiotics may somehow influence the endocrine system, possibly the level of circulating thyroxin. Such studies are in progress.

Regurgitation of Radio-Opaque Contrast Material through Normal Mitral Valves in Cinefluorographic Studies of Dogs.

R. E. PAUL, JUNIOR, *et alii* (*J. Appl. Physiol.*, January, 1958) report that radio-opaque contrast medium was introduced into the left ventricle by way of a retrograde catheter passed through the carotid and the aorta. Regurgitation through normal mitral valves takes place

during asystole, bradycardia, sinus arrhythmia and compensatory pauses after an extrasystole. Such regurgitations are diastolic and depend on the presence of a long period of ventricular diastasis. Ventricular tachycardias which shorten or eliminate diastasis prevent regurgitation through normal mitral valves. In these experiments the presence or absence of atrial systole plays a negligible role. Regurgitations associated with mitral valve lesions are systolic in time and present in every cycle.

Differential Susceptibility of Afferent Pathways to Anæsthetic Agents in the Cat.

C. T. RANDT *et alii* (*Am. J. Physiol.*, February, 1958) report that the effects of nitrous oxide, ethylene and cyclopropane on somatic afferent evoked potentials in the postero-ventral lateral nucleus of the thalamus, the peri-aqueductal reticular formation of the midbrain, the deep pretectal region of the midbrain, and the caudal paramedian reticular nucleus of the medulla oblongata were studied in 46 cats immobilized with muscle relaxants. The time of onset to maximal effect, percentage decrease in amplitude of the evoked subcortical potentials and the duration of depression incident to the administration of these anæsthetic gases in doses approximating those in clinical use showed quantitative correlation with the clinically observed potency of nitrous oxide, ethylene and cyclopropane in that order. The anæsthetic agents were shown to act differentially on four somatic afferent systems of diverse fibre size and characteristics of transmission, suggesting that the anæsthetic effect may be determined by factors in addition to the numerical preponderance of synapses in multi-neuronal systems. The evidence presented suggests more specific susceptibility of small fibre systems to the action of anæsthetic agents.

BIOCHEMISTRY.

Thyroid.

G. LITWACK (*J. Biol. Chem.*, October, 1957) has carried out studies *in vivo* showing that dietary thyroid produces a marked inhibition of tyrosine oxidation in normal or hypophysectomized animals. Low dietary protein level decreases liver tyrosine oxidation. Thyro-parathyroidectomy partially restores enzyme activity to that of untreated animals in spite of decrease in food intake. When thyroid is administered to untreated or thyroparathyroidectomized animals, a marked inhibition of specific enzyme activity occurs. Concomitant studies of liver xanthine oxidase activity demonstrate that the decrease of liver tyrosine-oxidizing capacity is not due to lowered protein intake. Studies *in vitro* demonstrate that diiodotyrosine inhibits the system at the substrate level, while thyroxine appears to inhibit uncompetitively at the tyrosine-glutamate transaminase level. Further studies show that the thyroxine inhibition does not involve the site of attachment of the substrate to the enzyme, the coenzyme, sulphydryl groups, or metal chelation. A comparison of the activities of analogues of thyroxine demonstrates that DL-thyronine or L-triiodothyronine is as effective as or a more effective inhibitor than thyroxine.

Biochemical Genetics.

C. E. DENT (*Am. J. Med.*, May, 1957) contributes a foreword to a symposium on "Inborn Errors of Metabolism". The symposium consists of nine articles, by various authorities, covering the following subjects: mechanisms in genetic diseases of man; pathogenic problems in phenylketonuria; galactosæmia; sporadic or non-endemic familial cretinism with goitre; inborn errors of metabolism in red cells of congenital hæmolytic anæmias; hypophosphatasia; Wilson's disease; the porphyrins; cystinuria.

Ascorbic Acid.

L. HELLMAN AND J. BURNS (*J. Biol. Chem.*, February, 1958) have reported that when carboxyl-labelled L-ascorbic acid metabolism in human subjects was followed, essentially all the administered C^{14} was excreted in urine chiefly as L-ascorbic acid, diketo-L-gulonic acid and oxalic acid, and that no C^{14} was detected in respiratory CO_2. The half-life of L-ascorbic acid in man averaged 16 days, the body pool averaged 20 milligrammes per kilogram, and the turnover rate averaged 1·0 milligramme per kilogram per day.

J. H. CRANDON *et alii* (*New England J. Med.*, January 16, 1958) report on blood ascorbic acid levels in surgical patients at the Boston City Hospital. Using the total plasma and buffy coat levels of ascorbic acid, there was an average fall of only 20% in 105 patients following mainly abdominal surgical procedures. This minor effect contrasts with the metabolism of ascorbic acid in experimental animals in response to stress. Of 46 patients with wound dehiscence only 19 showed deficient blood levels of ascorbic acid.

Blood Platelets.

H. WEISSBACH *et alii* (*Arch. Biochem.*, February, 1958) have studied the factors influencing the in-vitro binding of serotonin by dog platelets. Platelets have been found to be able to bind a variety of amines both *in vitro* and *in vivo*. Authors suggest that platelets may have the function of rapidly binding circulating amines so as to render them physiologically inactive.

Alcaptonuria.

B. N. LA DU *et alii* (*J. Biol. Chem.*, January, 1958) have investigated the metabolic defect in alcaptonuria. No detectable homogentisic acid oxidase activity was present in liver homogenate prepared from an alcaptonuric patient. Evidence is presented that the lack of activity was not due to the presence of an inhibitor or to the absence of any known co-factor. The defect in alcaptonuria appears to be a failure to synthesize active homogentisic acid oxidase. All of the other enzymes involved in tyrosine oxidation have essentially the same activity in alcaptonuric and non-alcaptonuric human liver. The sequence of reactions of tyrosine oxidation appears to be the same in human liver as in the other mammalian species. 2,5-Dihydroxyphenylpyruvic acid and 2,5-dihydroxyphenyl-DL-alanine are not oxidized in human liver homogenate preparations, and it is unlikely that these compounds are intermediates in the oxidation of tyrosine to homogentisic acid.

Cholesterol.

S. MUKHERJEE AND R. ALFIN-SLATER (*Arch. Biochem.*, February, 1958) have made a comparative study of the incorporation of acetate-1-C^{14} into cholesterol in liver slices from rats maintained on four experimental diets for one, four and 16 weeks. Maximum cholesterol synthesis was observed in the liver of rats receiving a diet containing 15% cotton-seed oil. Cholesterol synthesis was markedly reduced in animals receiving a fat-deficient diet and in those receiving the diet containing 30% hydrogenated coconut oil. The addition of the essential fatty acid, linoleic acid, to the animals on the fat-free diet maintained a normal liver cholesterol level and normal cholesterol synthesis. The depression of cholesterol synthesis in the livers of animals fed the fat-deficient diet may result from the accumulation of cholesterol in the liver which is observed in these rats.

R. Z. ALTSCHUL AND A. HOFFER (*Arch. Biochem.*, February, 1958) report that nicotinic acid in relatively large doses (three grammes daily) lowered the serum cholesterol in 11 out of 12 healthy medical students. The basal metabolic rate increased slightly but significantly. It seems that the relative response of cholesterol levels to nicotinic acid is related to the dosage in terms of body weight as well as to the initial cholesterol level. With dosage constant in terms of weight, the response may depend upon the initial cholesterol levels.

Pentosuria.

O. TOUSTER AND S. HARWELL (*J. Biol. Chem.*, February, 1958) have reported that chromatographic examination of deionized pentosuric urine, based on analyses for non-sugar periodate-reacting material, disclosed the presence of a considerable amount of a pentitol. Paper chromatographic analysis suggested that the substance was arabitol. Acetylation yielded arabitol penta-acetate as identified by melting-point tests and infra-red spectroscopy. Formation of DL-arabitol penta-acetate, when it was recrystallized with the D-isomer, demonstrated that the urinary product was the L-isomer. This isolation from pentosuric urine appears to be the first time that L-arabitol has been found in nature. The amount excreted by the pentosuric subject was several hundred milligrammes per day. Isotopic analysis of the L-arabitol isolated from the urine of a pentosuric subject given D-glucuronolactone-1-C^{13} suggests that the pentitol can be formed from this substance. The possibility that L-arabitol lies on a side path from the D-glucuronate-L-xylulose-xylitol pathway is suggested. Analysis of the urine of two normal subjects led to the isolation of small amounts of material which appeared to be DL-arabitol.

Special Article.

BRITISH PHARMACOPŒIA 1958.

THE BRITISH PHARMACOPŒIA 1958 (the ninth edition)[1] is to be officially adopted in Australia from December 1 of this year. With 160 new monographs and the 50 brought forward from the Addendum 1955, this is easily the largest and most comprehensive Pharmacopœia to date. The new monographs cover a very wide range of synthetics and specific chemotherapeutic agents catering for many and diverse therapeutic needs, together with antibiotics, hormones, biologicals and, for the first time, radioactive drugs.

Each successive British Pharmacopœia sees the liquidation of many therapeutic bankrupts, and no one will miss such pharmacological nonentities as clove, quassia, fennel and the oils of nutmeg, lavender, lemon, and bitter almond, or such homely, but time-worn, domestic medicines as the compound powders of liquorice, of rhubarb and of aromatic chalk. The axe, however, has fallen on quite a number of useful modern drugs, where these have been replaceable by therapeutic equivalents having a more potent or specific activity with fewer unwanted side-reactions.

With the application of penicillin and, to a lesser extent, other antibiotics to the treatment of syphilis, there has been a heavy mortality among the antisyphilitic drugs—those precursors of modern chemotherapy, sulpharsphenamine, neoarsphenamine and the oxophenarsines, several bismuth salts and injections, and the mercurials. Of the mercurials, so much in favour a couple of decades ago (and still prescribed, more as a matter of faith than of conviction), none remain. Even calomel is banished to a well-merited oblivion. The only remaining official mercurials are the yellow oxide and ammoniated mercury for the preparation of appropriate ointments, mersalyl acid as a diuretic and phenylmercuric nitrate as a bacteriostatic and fungicide, to which is now added thiomersal (merthiolate).

Amorphous penicillin and all the galenicals containing the penicillins for local application (cream, ointment, lozenges, and eye-drops) are now discarded—this obviously to avoid unnecessary sensitization of the patient and desensitization of bacteria to penicillin. For local antibiotic application with little risk of sensitization the problem is solved by the inclusion of neomycin and the polypeptide antibiotics, bacitracin and polymyxin B, which though occasionally used internally are, for the most part, too toxic except for local application. The antifungal antibiotics of the nystatin class have not yet been included.

For oral administration of penicillin, the benzylpenicillin tablets are retained, possibly as a concession to an established though diminishing practice, but, in addition, benzathine penicillin and phenoxymethylpenicillin, so much more resistant to digestive cleavage, are officially available as oral tablets. The tetracyclines, in forms suitable for oral and parenteral administration, are monographed, but presumably the more effective tetracycline with sodium metaphosphate is in the lengthening queue for the first Addendum. Of the streptomycins the only salts now official are the sulphates. Erythromycin, with a spectrum closely comparable with that of penicillin, makes its bow, presumably as a backstop for bacteria which have become penicillin-fast. It is available in tablets with an enteric coating which may be coloured.

The older antileprotics—used in their cruder forms almost from the dawn of history—chaulmoogra and hydnocarpus oils and their more modern ethyl esters are retrenched to give to the more potent "sulpha" analogues, dapsone and solapsone.

Sulphonamide with sulphathiazole and its sodium salt is dropped in favour of the safer and more slowly excreted sulphamerazine, which like sulphadimidine is a methyl pyrimidine derivative. To the antidysenteric group of "sulphas" phthalylsulphathiazole is added, but the daily dose quoted (10-15 grammes) suggests greater therapeutic efficiency than for sulphaguanidine and succinylsulphathiazole, which are allowed in doses of 10-20 grammes daily.

To the present official antihistamines, promethazine and mepyramine, are added four more—antazoline, chlorcycline, diphenhydramine and phenindamine—all perhaps better known by such proprietary names as "Antistin", "Diparalene", "Benadryl" and "Thephorin". While most of the antihistamines will give some relief from the tremor and related rigidity of Parkinson's disease, three synthetics have been especially adopted for this—benzhexol ("Artane" or "Pipanol"), ethopropazine ("Lysivane"), and procyclidine ("Kemadrin").

Naturally no modern pharmacopœia could avoid the inclusion of ataractic drugs. Yet despite the number and variety in common use, only two have found a place in the B.P. 1958—surely a monument to British conservatism! These are reserpine, one of the many alkaloids found in various species of rauwolfia, introduced originally as a hypotensive—and chlorpromazine ("Largactil"), a phenothiazine derivative closely related to promethazine and ethopropazine in the antihistaminic and antiparkinsonian groups respectively. Tribromoethyl alcohol and its solution bromethol, unable as basal anæsthetics to compete with the intravenous barbiturates for therapeutic safety and elasticity, are now deleted. On the other hand, the crowbar of a resurrected popular demand has once more jemmied a place in the Pharmacopœia for the old diehard sedative, carbromal, which was discarded from the B.P. 1932.

In dealing with biological products, a monograph relating to vaccines widens the scope of the term to include all preparations of antigenic materials administered for the purpose of provoking a specific immunity on the part of the recipient. The antigens so classed include bacteria, viruses, rickettsias, bacterial toxoids and toxins (scarlet fever prophylactic), and mixed antigens comprising any of these in association. Mixed vaccines of this type now admitted include diphtheria and pertussis, diphtheria, tetanus and pertussis, T.A.B.C., and T.A.B. and Tetanus. Human gamma globulin makes its debut with specific doses quoted for prevention or attenuation of measles, for the prevention of rubella in pregnant women and for the prevention of poliomyelitis and infective hepatitis.

A less spectacular, but by no means negligible, group comprises the anthelminthics. Carbon tetrachloride, for hookworm infestation, retires in favour of the safer and no less effective tetrachlorethane, while the recently introduced diphenan is now discarded in favour of salts of piperazine more familiar under such proprietary names as "Entacyl" or "Antepar". For these the B.P. quotes a daily dose for the treatment of threadworm, and a single massive dose of 4·5 grammes as an ascaricide. Hexylresorcinal, originally introduced as a diuretic, stages a comeback, now specifically as an ascaricide, though it has shown both safety and versatility in dealing as well with hookworm and even certain types of tapeworm. It is of interest to note that though crystal violet is official and has been widely used for threadworm, the B.P. has consistently avoided quoting a dose for this drug. Mepacrine, so useful as an antimalarial, is also given an anthelminthic dose.

These are but a few of the interesting groups of drugs introduced into the B.P. 1958. Among many others of no less interest are: the corticosteroids, hydrocortone, prednisone and prednisolone; antiepileptics, mesantoin and paramethadione, which are alkyl variants of phenytoin and troxidone respectively; acetazolamide, a carbonic anyhydrase inhibitor, as a diuretic; procainamide hydrochloride, as an alternative to quinidine, and carbimazole, for its antithyroid activity. Many of these, it will be noted, have already been admitted as pharmaceutical benefits in Australia.

Doses are stated with increasing frequency in terms of the Metric System only, in anticipation of the probable exclusion of the Imperial System from the next B.P.

The doses quoted are often related to some specific therapeutic practice: thus, for ammonium chloride, the dose is three to six grammes daily preceding mersalyl injections; for atropine methonitrate, two to six millilitres of a 0·01% aqueous solution before feeds, in congenital hypertrophic stenosis; for aspirin, in acute rheumatism, four to eight grammes (60 to 120 grains) daily, with the corresponding dose for the tablets of 12 to 24 daily. For chloroquine sulphate, individual doses are quoted for the suppression of malaria, for initial and controlling doses in oral therapy, for intravenous therapy (children and adults) and for its use in amœbiasis. Even the times of medication are sometimes given, as with dexamphetamine sulphate—five to ten milligrammes morning and mid-day. The phrase "the dose is determined by the physician in accordance with the needs of the patient" occurs less frequently, but we rather think that even in cases such as these, the B.P. Commission might volunteer (if only for the guidance of the dispenser) an average minimum to maximum range of doses—the more so in that it is specifically stated that the doses quoted are not binding on prescribers.

There is a considerable reduction in the number of galenicals, such as tinctures, infusions, spirits and emulsions, but,

[1] British Pharmacopœia 1958. Published under the direction of the General Medical Council; 1958. London: The Pharmaceutical Press. Published for the General Medical Council. 9" x 5½", pp. 140, with illustrations. Price: £3 3s. (English).

as a reflex of modern prescribing practice, there has been a great increase in the number of injections and of tablets, which are the subjects of much detail in two new monographs.

The use of English in the main titles of the monographs is retained, while for the subsidiary titles the Latin of the B.P. 1948 is discarded except such cases (e.g. Liquorice—Glycyrrhiza) as those in which the names in both languages differ considerably. The contracted forms of the English titles are often somewhat awkward, and unlike the older Latin abbreviations, do not fall trippingly from the tongue. Thus for Concentrated Compound Infusion of Gentian, we have "Conc. Co. Gent. Inf.".

Published under the direction of the General Medical Council, this monumental work is a tribute to the Pharmacopœial Commission, which, with the assistance of some twenty-two specialist committees and in consultation with numerous professional bodies in Great Britain, as well as throughout the British Commonwealth of Nations, has been responsible for its compilation and production.

Out of the Past.

In this column will be published from time to time extracts, taken from medical journals, newspapers, official and historical records, diaries and so on, dealing with events connected with the early medical history of Australia.

ROWDYISM AT THE SYDNEY UNIVERSITY.[1]

[From the *Australasian Medical Gazette*, May, 1891.]

THE riotous proceedings, and we cannot fittingly designate them by any other term, of the undergraduates of the Sydney University at the proceedings on Commemoration Day have given rise to very considerable adverse comment in the Press of the colony. Some desire has been exhibited by partisans of the students to excuse or palliate their very disgraceful misconduct on this occasion by pleading the examples of the Universities of Oxford and Cambridge where some licence is permitted to alumni on similar occasions. This has apparently been tolerated in deference to tradition and has been practised during a long series of years. Though we do not admit custom as being a good excuse for improper conduct, there is some reason for the latitude allowed when it has been the growth of centuries. The circumstances are very different when the day of ceremony so abused has only been celebrated for twenty or thirty years. If the young men cannot think for themselves, the governing body should think for them and by fitting penalties convince them of the folly and indecency of their conduct.

Correspondence.

PREEXISTING AND CHRONIC AILMENTS.

SIR: Inquiry from members of the medical profession on behalf of chronically ill patients prompts me to outline the policy of the Medical Benefits Fund of Australia regarding this all-important subject.

A distinction is drawn between a condition the symptoms of which, irrespective of diagnosis, were in evidence to the patient at or prior to joining the Fund and a chronic or recurring condition which manifests itself after the member's enrolment. Benefits paid contain two ingredients. The smaller Commonwealth portion is payable irrespective of the history or duration of the illness, but the larger Fund portion is not payable if the condition is preexisting. This rule is waived in the case of medical benefits (not hospital benefits) after two years' continuous membership. The Fund also grants medical benefits, but not hospital benefits, for chronic conditions subject always to the preexisting ailment rule. The retention of the above policy is influenced by the obvious need to preserve the incentive to insure and a sense of trusteeship obligation to the two million members of this non-profit mutual organization. Nevertheless the administrative interpretation can be simply expressed—"if there remains a doubt after reasonable inquiry the benefit of the doubt is given to the member".

Eleven years have passed since the inauguration of the Medical Benefits Fund and five since the commencement of the Commonwealth Medical Scheme. And people are still joining for the first time. While it is possible that many of these people delay insuring until medical care becomes imminent, others simply lack basic prudence. Should the nature of a claim for benefit appear to the Fund's trained medical assessors to be in respect of a preexisting ailment, the member is asked to have his doctor complete a medical certificate. It is appreciated that the burden of completion of medical certificates falls on the profession, but there are occasions when a contributor's entitlement can only be fairly assessed in the light of the answers given by his doctor to the specific questions in the form of certificate. Those claims which for medical reasons cannot be resolved by the Fund's assessors are referred to an experienced medical practitioner member of the honorary Executive Committee. Should a member appeal and introduce fresh medical evidence, the claim is reviewed by the Fund's full honorary Executive Committee of medical practitioners and representative laymen. Claims paid at reduced rates for preexisting ailments barely exceed 1·0% of the total lodged. A proud record indeed when one considers that the monthly enrolment rate of new members rarely falls below 25,000.

As announced by the Treasurer in the budget speech on August 5, the Commonwealth will introduce legislation to guarantee the Funds against loss in settling claims of both classes. In this way an important gap will be filled to the contributors' advantage. Whatever the ultimate form of this legislation, it will be essential to preserve both the rights of the 70% who have already joined Funds and the incentive to the remaining 30% to join in order to receive the full benefits of the government policy.

Yours, etc.,

J. F. CADE,
General Manager, Medical Benefits Fund of Australia.

32 Jamison Street,
Sydney,
August 14, 1958.

IMMUNIZATION AGAINST TETANUS.

SIR: Of late, increased interest has been shown in the tetanus toxoid method of immunization against tetanus. The main reason for this has been the evanescent nature of the immunity conferred by tetanus antitoxin and the infrequent but severe reaction which may follow its use.

In May, 1957, 25 members of the staff, all ex-servicemen from the 1939-1945 war, were given tetanus toxoid inoculations. The inoculation was one millilitre of prophylactic toxoid. The Commonwealth Serum Laboratories carried out studies five weeks later as to the level of immunity conferred by this one injection. It was found that in 23 the level of antitoxin titre was satisfactory. In the other two, one man had doubts as to whether he had received tetanus toxoid during the war, the other one it was thought may have been a slow responder. It is hoped to continue these studies. My reason for reporting this finding is that it is an indication of the long duration of immunity conferred by tetanus toxoid, and that a booster dose in ex-servicemen who had received toxoid previously is sufficient apparently to restore immunity to a satisfactory level. I should like to express my appreciation to the staff of the Commonwealth Serum Laboratories for carrying out this study.

Yours, etc.,

F. S. PARLE,
Medical Officer, Trans-Australia Airlines.

339 Swanston Street,
Melbourne,
August 12, 1958.

PHARMACEUTICAL BENEFITS ADVISORY COMMITTEE.

SIR: I recently required prednisone for a patient in severe status asthmaticus, who was covered by the definition adopted by the Pharmaceutical Benefits Advisory Committee. I ordered and received permission for 30 five-milligramme tablets, but when requesting a further ten tablets these were refused, though I had supplied clinical details as requested. The refusal read: ". . . It is regretted

[1] From the original in the Mitchell Library, Sydney.

that this application is not approved as the maximum number of tablets allowed for any one attack of Status Asthmaticus has already been approved for this patient." In urging the profession to press for a change in this attitude I would like to emphasize the following points:

1. General medical opinion is in broad agreement with the dosage suggested by the Medical Research Council in 1956 for status asthmaticus, namely, that 300 milligrammes of cortisone acetate should be given on the first day, 200 milligrammes on each of the following two days, and 100 milligrammes on each of the following four days. Further, 25 milligrammes of cortisone acetate correspond to five milligrammes of prednisone, and therefore we would require 44 tablets of either. However, 40 tablets of cortisone acetate (25 milligrammes) or 30 tablets of prednisone (five milligrammes) are the maximum allowed.

2. The Commonwealth Director of Health for N.S.W., who refused further supplies, but was very agreeable and cooperative, suggested that the profession exert pressure on the Pharmaceutical Benefits Advisory Committee to change its rigid rules in regard to maximum quantities.

In conclusion, may I point out that the patient concerned is an invalid pensioner and quite unable to pay for the tablets, which he has, of course, already used.

Yours, etc.,

940 Woodville Road,
Villawood,
New South Wales.
August 11, 1958.

R. KLUGMAN.

REHABILITATION AND RHEUMATOID ARTHRITIS.

SIR: It was gratifying to read the excellent article (M. J. AUSTRALIA, August 9, 1958) by Dr. Naomi Wing on rehabilitation of the patient with rheumatoid arthritis. Although one's experience dictates variance with some details, the basic points which she has stressed should be closely sudied by all who have an interest in this universal problem. Empiricism may be dominant in those diseases in which the ætiology is unknown and for which there is no specific treatment, but this should not preclude clear thinking and a pattern of treatment with well-defined fundamental aims. With this approach, many of the mystical methods of the past will be discarded. There is no patient with rheumatoid in whatever stage who cannot be helped in some manner. Only by working with this maxim in mind can we satisfactorily meet the challenge of the most crippling of the rheumatic diseases.

Yours, etc.,

Western House,
Collins and William Streets,
Melbourne.
August 13, 1958.

GEORGE MCEWEN.

THE PRACTICE OF MORE THAN ONE SPECIALTY.

SIR: In a recent edition you published a new by-law of the rules of the W.A. Branch. This states that in future only one specialty may appear on a name-plate, and goes on to mention that "gynæcologist" is in order, as is also "oculist". The inference is that obstetricians are not to practise gynæcology, eye men are not to do any E.N.T., and perhaps otologists not to do nasal or throat work.

This may or may not be advisable in a large city; it is certainly a blow at the country specialist. At any rate it is not a matter with which the B.M.A. should concern itself. The Association should protect the right of the individual to practise the branches of medicine in which he is interested. I can remember one prominent doctor who did "mids. and kids", another who did otology and orthopædics. and why not?

Yours, etc.,

Perth,
Western Australia,
July 21, 1958.

WARUM.

[This letter was referred to the Western Australian Branch, and the following comment has been received:

The Executive Committee of the Western Australian Branch considers that the correspondent has not read accurately the by-law to which he refers and suggests that this is a matter on which any member, being in doubt, might well approach the Council of the Branch for advice.]

STONE-FISH STING AND ITS TREATMENT.

SIR: I was very interested to read of the dramatic pain-relieving value of emetine hydrochloride when applied to stone-fish stings; I had been awaiting an opportunity to try this treatment myself since reading a letter in the *British Medical Journal* some two years ago, when equally remarkable results were obtained by using emetine for the treatment of scorpion bites (which I believe are equally painful). I wonder whether this letter could have been the small paragraph to which Dr. Wiener's correspondent in the New Hebrides refers.

It would be interesting to know if anyone else has had any similar experience with emetine, and one also wonders what effect it might have on the sea-wasp stings encountered in northern Queensland.

Yours, etc.,

Bulcock Street,
Caloundra,
Queensland.
August 22, 1958.

D. A. GILL.

Naval, Military and Air Force.

APPOINTMENTS.

THE following appointments, changes, etc., are published in the *Commonwealth of Australia Gazette, No. 34*, of June 19, 1958.

NAVAL FORCES OF THE COMMONWEALTH.

Permanent Naval Forces of the Commonwealth (Sea-Going Forces).

Promotion.—Sub-Lieutenant (U.) (on probation) Terence Joseph Horgan is promoted to the rank of Surgeon Lieutenant (on probation), dated 11th January, 1958.

Resignation.—The resignation of Brian Warren Curlewis of his appointment as Surgeon Lieutenant-Commander (for Short Service) is accepted, dated 6th May, 1958.

AUSTRALIAN MILITARY FORCES.

Australian Regular Army.

Royal Australian Army Medical Corps (Medical).

1/8072 Captain F. R. Wilson relinquishes the temporary rank of Major, 7th April, 1958, and is transferred to the Reserve of Officers (Royal Australian Army Medical Corps (Medical)) (Northern Command), 8th April, 1958.

The notification respecting 2/40168 Lieutenent (Temporary Captain) W. F. Hammond which appeared in Executive Minute No. 29 of 1958, promulgated in Commonwealth Gazette No. 26 of 1958, is withdrawn.

To be Temporary Major, 2nd May, 1958.—1/8079 Captain H. A. Muir.

Citizen Military Forces.

Northern Command.

Royal Australian Army Medical Corps (Medical).—To be Captain (provisionally), 12th May, 1958: 1/46919 George Roderick Cooper McLeod.

Eastern Command.

Royal Australian Army Medical Corps (Medical).—The provisional appointments of the following officers are confirmed: Captains 2/127051 I. H. E. Dawson and 2/146610 A. P. Skyring. The following officers are transferred to the Reserve of Officers (Royal Australian Army Medical Corps (Medical)) (Eastern Command): 2/115677 Major M. T. Havyatt, 29th April, 1958, and 2/146610 Captain A. P. Skyring, 24th February, 1958. To be Majors, 9th May, 1958: Captains (Temporary Majors) 2/127807 J. B. Westphalen, 2/127881 R. B. Geeves, 2/130110 F. M. Grace, 2/152043 J. Laing and 2/206958 W. R. M. Shaw.

Southern Command.

Royal Australian Army Medical Corps (Medical).—3/101834 Captain B. W. Fox is seconded whilst in the United Kingdom, 15th January, 1958. 3/129385 Captain (provisionally) M. G. Whiteside ceases to be seconded whilst in the United

Kingdom, 1st January, 1958. The regimental seniority of 3/129041 Major B. C. A. Stratford is effective from 29th April, 1957. 3/101839 Captain D. M. Ritchie relinquishes the provisional rank of Captain, 30th March, 1958, and is transferred to the Reserve of Officers (Royal Australian Army Medical Corps (Medical)) (Southern Command) in the honorary rank of Captain, 31st March, 1958. To be Majors, 2nd May, 1958, with pay and allowances of Captain at own request: Captains 3/101018 W. N. Sloan, 3/101834 B. W. Fox, 3/101026 J. W. C. Riddell and 5/26466 G. I. Howard. To be Captain (provisionally), 15th May, 1958: 3/745021 Neil Arthur Bromberger.

Central Command.

Royal Australian Army Medical Corps (Medical).—4/32052 Captain (provisionally) J. R. Richards relinquishes the provisional rank of Captain, 31st December, 1957, and is transferred to the Reserve of Officers (Royal Australian Army Medical Corps (Medical)) (Central Command) in the honorary rank of Captain, 1st January, 1958. 4/35506 Captain (provisionally) V. Horvat relinquishes the provisional rank of Captain, 9th April, 1958, and is transferred to the Reserve of Officers (Royal Australian Army Medical Corps (Medical)) (Central Command) in the honorary rank of Captain, 10th April, 1958.

Western Command.

Royal Australian Army Medical Corps (Medical).—5/21578 Major C. Stuart, M.C., is appointed to command 7th/13th Field Ambulance, and to be Temporary Lieutenant-Colonel, 11th April, 1958. 5/26429 Lieutenant-Colonel K. W. H. Harris relinquishes command 7th/13th Field Ambulance, 10th April, 1958.

Tasmania Command.

Royal Australian Army Medical Corps (Medical).—The provisional rank of 2/146611 Captain M. J. K. Tarlinton is confirmed.

Reserve Citizen Military Forces.

Royal Australian Army Medical Corps (Medical).

The following officers are placed upon the Retired List with permission to retain their rank and wear the prescribed uniform:

Eastern Command.—Captain R. Cuttle, 30th April, 1958.

Western Command.—Captain M. F. Williams, 30th June, 1958.

The following officers are retired:

Southern Command.—Captain R. C. Bretherton, 9th May, 1958.

Central Command.—Honorary Captains F. Goldby and G. E. Peters, 30th June, 1958.

Western Command.—Honorary Captain M. O'C. Gorman, 30th June, 1958.

The following appointments, changes, etc., are published in the *Commonwealth of Australia Gazette*, No. 36, of June 26, 1958.

Australian Military Forces.

Australian Regular Army.

Royal Australian Army Medical Corps (Medical).

The Short Service Commission granted to 2/40187 Captain F. A. Lilier is extended until 2nd September, 1960.

2/40205 Captain W. J. Watson is appointed from the Regular Army Special Reserve, Royal Australian Army Medical Corps (Medical), 6th June, 1958, with a Short Service Commission for a period of two years.

The date of appointment of 3/12026 Captain H. J. Hodgson which appeared in Executive Minute No. 99 of 1956, promulgated in Commonwealth Gazette No. 48 of 1956, is amended to read "23rd May, 1956".

To be Captain, 31st December, 1957, with a Short Service Commission for a Period of One Year.—1/8077 Charles Roy Wilson.

Regular Army Special Reserve.

Royal Australian Army Medical Corps (Medical).

NX700470 Captain W. J. Watson is appointed to the Australian Regular Army, Royal Australian Army Medical Corps (Medical), 6th June, 1958.

To be Captain, 6th June, 1957.—NX700470 Lieutenant W. J. Watson.—(Ex. Min. No. 45—Approved 18th June, 1958.)

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED AUGUST 16, 1958.[1]

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.	Australian Capital Territory.	Australia.
Acute Rheumatism	3	1(1)	5(2)	..	..	..	1	..	10
Amœbiasis	..	..	..	..	..	..	..	..	..
Ancylostomiasis	..	..	4	..	..	..	17	..	21
Anthrax	..	..	..	..	..	..	..	..	..
Bilharziasis	..	..	..	..	..	..	..	..	..
Brucellosis	..	..	..	..	..	..	..	..	..
Cholera	..	..	..	..	..	..	..	..	..
Chorea (St. Vitus)	..	..	..	..	..	..	..	..	..
Dengue	..	..	..	..	..	..	..	..	..
Diarrhœa (Infantile)	3(2)	19(18)	3	..	..	..	13	..	38
Diphtheria	..	..	..	..	..	..	..	..	..
Dysentery (Bacillary)	..	3(3)	2	3(3)	2(1)	..	1	..	11
Encephalitis	2	..	1(1)	..	..	..	..	..	3
Filariasis	..	..	..	..	..	..	..	..	..
Homologous Serum Jaundice	..	..	..	..	..	..	..	..	..
Hydatid	..	..	..	..	..	..	..	..	..
Infective Hepatitis	62(19)	30(10)	9	4(4)	3(1)	..	1	..	109
Lead Poisoning	..	..	..	..	..	..	..	..	..
Leprosy	..	..	..	..	..	..	..	..	..
Leptospirosis	..	..	..	..	..	..	..	..	..
Malaria	..	..	2[2]	..	..	..	..	..	2[2]
Meningococcal Infection	2(1)	1	1(1)	..	..	..	..	..	4
Ophthalmia	..	..	..	..	..	..	..	..	..
Ornithosis	..	..	..	1(1)	..	..	..	..	1
Paratyphoid	..	..	..	..	..	..	..	..	..
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	1(1)	1(1)	..	..	..	..	..	..	2
Puerperal Fever	..	..	7	..	..	..	..	..	7
Rubella	..	38(30)	1(1)	3(2)	137(112)	..	..	10	189
Salmonella Infection	..	..	..	..	..	..	..	1	40
Scarlet Fever	13(10)	13(11)	5(2)	3(3)	5(4)	..	..	..	..
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	..	1(1)	..	..	..	..	..	..	1
Trachoma	..	..	..	..	1	..	..	..	1
Trichinosis	..	..	..	..	..	..	..	..	..
Tuberculosis	21(15)	19(17)	13(10)	6(5)	10(6)	3(1)	1	..	73
Typhoid Fever	..	..	1	..	..	..	..	..	1
Typhus (Flea-, Mite- and Tick-borne)	..	..	1	..	..	..	..	..	1
Typhus (Louse-borne)	..	..	..	..	..	..	..	..	..
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] Figures in parentheses are those for the metropolitan area.

[2] Infection contracted outside Australia.

ROYAL AUSTRALIAN AIR FORCE.

Permanent Air Force.

Medical Branch.

The probationary appointment of Flight Lieutenant G. Duncan (0310761) is confirmed.

The following Flight Lieutenants are granted the acting rank of Squadron Leader: W. I. Stuart (0310760), 9th April, 1958; E. R. Bowler (0310759), 18th April, 1958; G. S. Radford (025626), 8th July, 1958.

Air Force Reserve.

Medical Branch.

The following former officer is appointed to a commission, 25th February, 1958, with the rank of Flight Lieutenant (Temporary Squadron Leader): P. A. Foley (253725).

The appointment of Flight Lieutenant G. B. Downes (2283) is terminated, 22nd October, 1957.

Notes and News.

Phytotron for Australia.

The Commonwealth Government has decided to provide £500,000 to enable C.S.I.R.O. to construct a phytotron at the Division of Plant Industry at Canberra. This is to consist of a series of 200 cabinets in which plants can be grown under controlled conditions of temperature, moisture and light. All the components of the man-made climate in each cabinet can be varied in order to simulate the climate of any place in Australia, in respect of the hours of daylight, winter or summer temperatures, and rainfall.

This piece of equipment will enable the scientists of the Plant Industry Division of C.S.I.R.O. to discover in the shortest possible time where any particular plant will grow to best advantage in Australia. This will save a great deal of time and effort in trying out a particular plant in a dozen places throughout Australia in order to find out where it flourishes best. It will also enable scientists to breed plants to suit the climate of particular parts of Australia.

Corrigendum.

AN error occurs in line 9 of the letter on "Chloroquine" by John Poolman in the issue of August 23, 1958, at page 273. The dose which is printed as "520 milligrammes" should be "250 milligrammes". We regret this error.

Medical Appointments.

Dr. A. Maxwell-Allison has been appointed Inspecting Medical Officer, Mental Deficiency Services, Mental Hygiene Branch, Department of Health, Victoria.

Dr. R. W. Smith has been appointed Honorary Assistant to the Director of the Psychiatric Clinic at the Royal Adelaide Hospital, Adelaide.

Dr. W. A. J. Brady has been appointed Psychiatrist Superintendent, Mental Hygiene Branch, Department of Health, Victoria.

Nominations and Elections.

THE undermentioned have been elected as members of the New South Wales Branch of the British Medical Association: Hackett, Robert Edward, M.B., B.S., 1958 (Univ. Sydney); Thomas, Maxwell Sydney, M.B., B.S., 1958 (Univ. Sydney); Withers, Kelvin Lawry, M.B., B.S., 1958 (Univ. Sydney); La Vere, Graham Vaughan, M.B., B.S., 1957 (Univ. Sydney); Becroft, Thelma Constance, M.B., Ch.B., 1950 (Univ. New Zealand); Congdon, Roger George, M.B., B.S., 1955 (Univ. London); Gibson, William Hector, M.B., B.S., 1951 (Univ. Sydney); Jamieson, Walter Connal, M.B., B.S., 1955 (Univ. Sydney); Sternberg, Harry, L., L.M., R.C.P. (Ireland), L., L.M., R.C.S. (Ireland), 1956; Havas, Alexander, M.D., 1929 (Univ. Debrecen) (registered in accordance with the provisions of Section 17 (2B) of *The Medical Practitioners Act*, 1938-1958); Ozols, Olgerts-Konstantins, M.D., 1944 (Univ. Riga) (registered in accordance with the provisions of Section 17 (2B) of *The Medical Practitioners Act*, 1938-1958); Pal, Andor, M.D., 1933 (Univ. Budapest) (registered in accordance with the provisions of Section 17 (1c) of *The Medical Practitioners Act*, 1938-1958); Wechsler, Helen, M.D., 1938 (Univ. Vienna) (registered in accordance with the provisions of Section 17 (1c) of *The Medical Practitioners Act*, 1938-1958).

Deaths.

THE following death has been announced:

DUVAL.—Ferdinand Duval, on August 26, 1958, at Melbourne.

Diary for the Month.

SEPT. 9.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
SEPT. 11.—New South Wales Branch, B.M.A.: Public Relations Committee.
SEPT. 11.—South Australian Branch, B.M.A.: Council Meeting.
SEPT. 12.—Queensland Branch, B.M.A.: Council Meeting.
SEPT. 12.—Tasmanian Branch, B.M.A.: Branch Council.
SEPT. 15.—Victorian Branch, B.M.A.: Finance, House and Library Subcommittee.
SEPT. 16.—New South Wales Branch, B.M.A.: Medical Politics Committee.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Medical Secretary, 135 Macquarie Street, Sydney): All contract practice appointments in New South Wales. Anti-Tuberculosis Association of New South Wales. The Maitland Hospital.

South Australian Branch (Honorary Secretary, 80 Brougham Place, North Adelaide): All contract practice appointments in South Australia.

Editorial Notices.

ALL articles submitted for publication in this Journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given: surname of author, initials of author, year, full title of article, name of journal, volume, number of first page of the article. The abbreviations used for the titles of journals are those adopted by the Quarterly Cumulative Index Medicus. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors submitting illustrations are asked, if possible, to provide the originals (not photographic copies) of line drawings, graphs and diagrams, and prints from the original negatives of photomicrographs. Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary is stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2-3.)

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